MAY 30, 1960

American Machinist / Metalworking Manufacturing

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Color coding helps precision inspection of tiny missile parts—see page 1

Coolants for carbide grinding make sense, page 90

Destructible Mandrels, page 79
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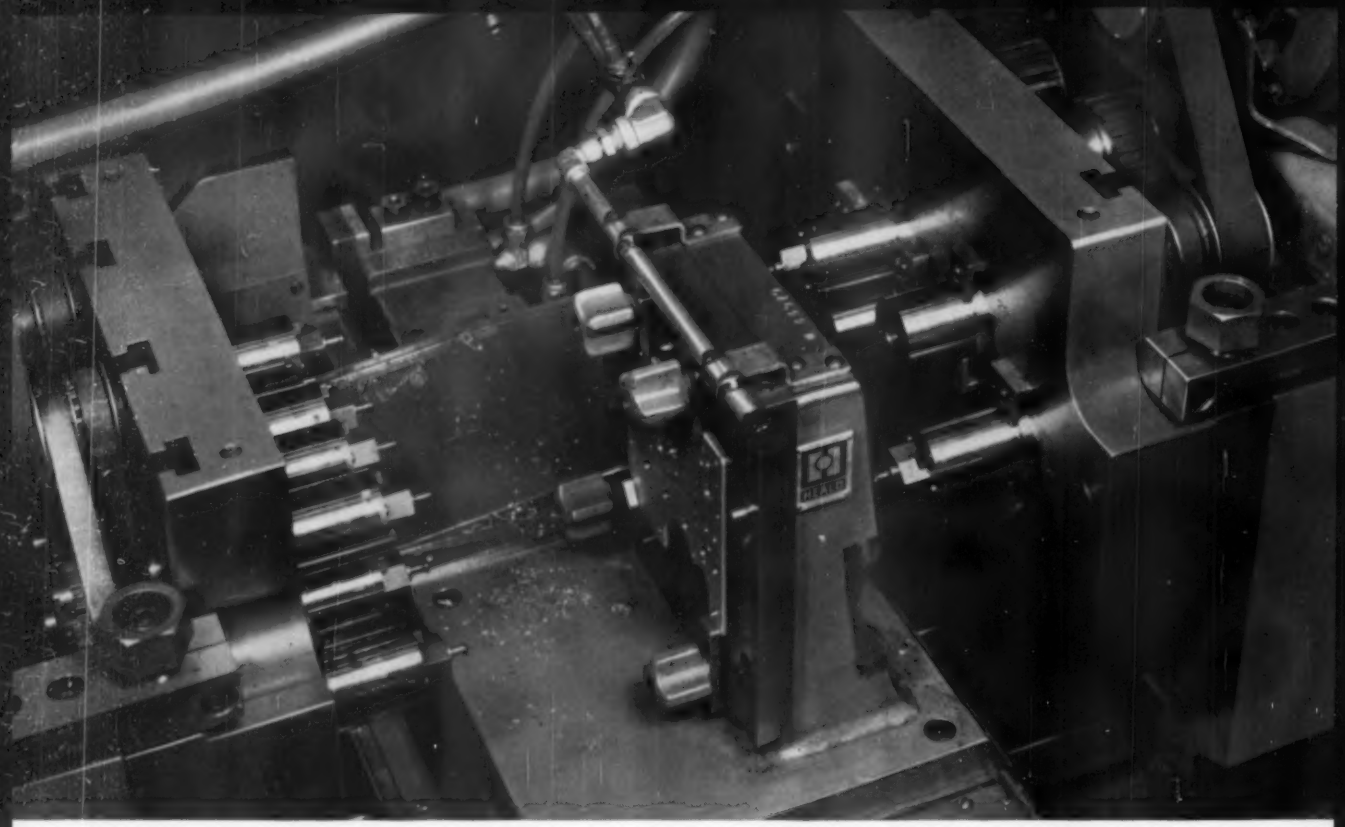


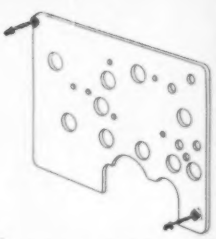
Bore 23 holes on 1 machine

Heald Model O Bore-Matic solves multiple-hole Borizing problem with interchangeable Multi-Spindle Heads

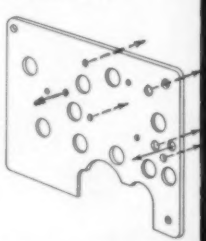
The Problem—to precision bore 23 holes, ranging from .0365″ to .3570″ in diameter, in medium-hard aluminum gear-box plates, with a tolerance of .0005″ on diameter and .0009″ on centers—also to bore 12 similar holes in a matching plate.

The Solution—a Heald double-end Model O Bore-Matic equipped with two sets of interchangeable Multi-Spindle boringheads. As shown in the drawings at the right, the 23-hole plate is precision Borized to the required tolerances in only three operations, using an indexing cross-slide and with all holes accurately positioned by cross-slide index and spindle location. One set of Multi-Spindle heads is used for the first two operations—then spindle plates are changed for the final operation. The second set of spindle plates also finishes all bores in the 12-hole plate in two operations. Average production is 10 parts per hour.

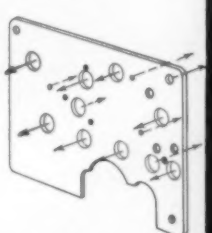
Heald Multi-Spindle boringheads consist of interchangeable spindle plates, precision bored to mount the desired number of miniature Red-Head boringheads which are belt-driven from a single motor. This arrangement permits simultaneous Borizing of multiple holes with center distances as close as ¾″. To save production time and cost on your multiple-hole borizing jobs, ask your Heald engineer for complete information on Model O Bore-Matics.



1. Bore two locating holes in single-end cycle using spindle plate No. 1.



2. Bore 7 holes in double-end cycle using spindle plates No. 1 and 2.



3. Replace spindle plates No. 1 and 2 with No. 3 and 4 and bore 14 holes in double-end cycle.

(Arrows show direction of table travel for holes indicated)

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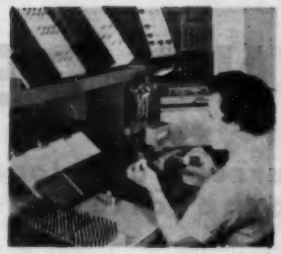

Cover: *Jeanette Frechette checks valve components at Raytheon missile systems plant. Colored foam plastic trays tie in with color coding on electrical limit gages.*

American Machinist / *Metalworking Manufacturing*

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TURN PAGE FOR METALWORKING REPORT —→

METALWORKING REPORT

Significant current developments in tooling and production processes

CUTTING

Shear-Forming Formula

What is the maximum angle to which you can shear-form a given metal blank without rupture? The answer is in a formula developed by Richard Kegg of Cincinnati Milling.

According to experimental results with blanks of different metals formed over an ellipsoid mandrel (where the shear angle varied gradually from 180 to 9°), shear-forming capability corresponds closely to results in tensile tests for the same work materials. As in tensile tests, the shear-forming operation stresses and elongates the work until fracture occurs.

Thus, expensive trial-and-error runs can be avoided by working out the formula for each new work material to be shear-formed; see p 83.

Also in the same article is a report from MIT that some of our notions about sulphurized and leaded steels may be in for revision. Sulphur, for example, seems to create a trouble area at around 0.005 ipr feed, but feeds higher or lower are easier. There is apparently an optimum tool-chip contact length for best tool life at a given feed. This is affected by lead content in the work steel.

Portable Gun Drill

Traditionally, shop men have regarded a gun drill as an immovable object—too delicate and too expensive to move. Hence, the work is brought to the gun drill, and not vice versa. Douglas Aircraft has just pulled a complete about-face on tradition, has come up with gun drills that can be toted around the shop to do fast, accurate (to within ±0.0005 in.) on-the-spot drilling of comparatively short holes in bulky parts. As Douglas puts it, "Holes are now produced in components of an assembly when they are needed, not before." (See p93).

FORMING

Wash-out, Melt-out Mandrels

Chance Vought Aircraft, Dallas, is building fiberglass laminates around plastic mandrels that can be washed out, melted out, or broken out. Two types of plastic mandrel materials are used, one for casting at temperatures to 330 F and the other at temperatures up to 540 F. With the new materials, both commercially available, tree-shaped, corkscrew-shaped, and spherical mandrels can be cast, then melted out or flushed out with ordinary tap water. If melted out, the material may be re-used. (See p79).

Fast Blank Heater

Titanium, magnesium, Inconel, and molybdenum form best if heated before use at drop hammer or press. Various means have been devised to heat blanks or sheets, including ovens and electric blankets.

Loss of heat from the work during transfer to the press has been a problem. This loss is avoided, it is said, by use of a portable radiant heater that can be raised or lowered, extended or retracted, over the workpiece and form block by means of a remote control.

The portable radiant heater is built by the Electric Hotpack Co., Philadelphia. The gold-plated lamp head holds up to 99 infra-red quartz bulbs to produce temperatures up to 1500 F. No warm-up period is required.

By use of the heater, blanks can be heated and formed in seconds, with an improvement in elongation of as much as 11%. The lamps cut off the instant the head retracts. Fan cooling protects against overheating. Easy adjustment of the head is produced by a pneumatic control.

INSPECTION

Fast Flaw Detection

X-ray detection of flaws is branching out in several directions. Continuous inspection of welded pipe at speeds to 40 fpm is expected soon, according to John Battema, product manager for Industrial Radiography Equipment, Philips Electronic Instruments, Mt Vernon, NY.

Mr Battema says that the film must be interpreted within 2 or 3 minutes after exposure in order that flat cars can be loaded with pipe in 7 min. High-speed film similar to that used in the Polaroid process may have to be used. The film would move continuously over developing and fixing agents and be viewed wet.

High-speed motion-picture fluoroscopy is now being used by a missile manufacturer. The powerful intensifier gives an image 1000 times brighter than is secured from conventional equipment. Electrical components and hermetically sealed devices can be checked for flaws and erratic performance by such use of X-rays.

One company that produces long-range ballistic missiles is using X-ray equipment to check welded titanium spheres which are employed to hold liquid oxygen. In the automotive field, X-rays are checking welded platinum tips on special spark plugs. Inspection of welded assemblies by the X-ray method is expected to expand greatly in the next twelve months, both by industry and state governments.

HEAT TREATING

High-Temperature Treatment

Basic research now going on in the high-temperature treating of steel could be "the development of this generation" in the metallurgical field, said Walter Crafts, president of the American Society for Metals, when interviewed during the ASM's Southwestern Metal Congress in Dallas.

Researchers have already made a breakthrough of tremendous signif-

icance. General Electric has sucessfully built up the strength of steel samples to 400,000 psi consistently, often to 500,000 psi. This compares with present top strengths of about 300,000 psi. Crafts added that there have been reports of GE researchers successfully reaching strengths of 750,000 psi with elongation of 10%.

He believes that the same high-temperature heat-treating techniques can be used on refractory metals to produce high-heat-resistant composite materials in the 5000 F range. At present we are limited to about 2500 to 3000 F with existing materials.

THE OUTLOOK

Metalworking production as measured by the AM/MM Index stands at 105, and is steady. Railroad car business is steady. Sheetmetal shops report business steady and holding firm. Tool and die sales and orders are still rising, but seem to be leveling off. Materials handling equipment bookings rose for third straight month. *See page 73.*

WELDING

Steam-shielded Welding

Here's a Russian "first" we won't dispute. A recent report claims a new method of welding under a protective cover of steam, according to the Soviet daily, *Promyschlenno-Ekonomitscheskaja Gazeta.*

They admit that humidity near the welding arc normally causes cracks and porosity, but they claim that, by intentionally increasing the humidity with steam piped into the weld zone, they can eliminate the harmful effects. Semi-automatic welding with a 0.078-in. wire, DCSP, and a steam atmosphere produced weld metal consisting of ferrite and a large part of pearlite, they say.

Maybe it works for the Russians, but US authorities are not enthusiastic. Their reaction: It may be possible, but it would have a very limited application.

ASSEMBLY

Molded Flush Boards

Molded flush circuits—printed circuits that appear to be more reliable than present designs—have been announced with a Copper & Brass Research Assn award to R M Bell and Athan Stosuy of IBM. Strips of 0.003-in. copper are treated to add a thin coating of powdered copper or bronze, then a plastic backup plate is molded to the strip—or strip assembly. The part is molded against a flat plate, so the copper and plastic are flush.

Joining is more by mechanical gripping than bonding, because the powdered-metal particles become surrounded by molded plastic, and the joints are therefore positive. The arrangement will allow much harder physical handling than usually possible with printed circuits. Metallic inserts and holes can be molded into the part, so fabricating is less expensive.

FINISHING

Dip Treatment Protects Aluminum

Said to be superior to anodizing in some respects, a protective finish for wrought and cast aluminum has been introduced by PMD Chemicals, Ltd, Coventry, England. Called Alchromate, the process is a simple, non-electric immersion treatment that yields a translucent, golden-yellow coating which, unlike anodic films, is ductile. It provides a good bonding surface for paint and may be applied to work containing steel or brass inserts, as the solution has no effect on these.

The electrical resistance of the coat is higher than that of the untreated metal, but there is no insulating layer, as with anodizing, so it is not necessary to remove the film for electrical contact, and there is no possibility of initiating corrosion at electrical junctions. It is suggested that damaged anodic films may be repaired by swabbing the affected areas with the Alchromate solution.

Guaranteed Chrome Plating

To re-establish public confidence in chromium plating, particularly among buyers of automobiles, the Mond Nickel Co Ltd of Great Britain has launched a Quality Label scheme. Collaborating with Mond in the scheme are the British Standards Institute and the British Nonferrous Metals Research Ass'n, and their avowed objective is "to eliminate sub-standard electroplating."

It is pointed out that, while the quality of chrome plating has not actually deteriorated during the past few years, there has been a tremendous increase in the corrosiveness of the atmosphere. Furthermore, there has been a great increase in the amount of plated work, and corrosion-susceptible steel and zinc have replaced much of the former paint and brasswork.

Admittedly a propaganda campaign, labels will be issued in different colors to indicate whether a deposit is suitable for severe (red), moderate (blue), or mild service (green). Users of the labels will be required to sign an undertaking that they will be used correctly on plating tested to British Standards 1224:59.

Quick Clean Saves Rework

Hot forming of titanium darkens the metal and makes it difficult to detect small pits and blemishes caused by scale on the forming dies. Such defects are not normally found until the complete batch of parts is pickled, and considerable time must then be spent in reworking and polishing. To avoid this, Ryan Aeronautical Co now gives every fifth piece a quick pickle to show up defects which indicate that the forming dies need cleaning.

MATERIALS HANDLING

Zinc-Oxygen Fuel Cell

A rechargeable zinc-oxygen cell, forerunner of other fuel cells, has just been announced by the Exide Industrial Div of The Electric Storage Battery Co. Exide believes that "within a few years" (possibly three) it can develop practical cells, capable of being mass produced, that will be several times more powerful per cubic foot than fuel cells so far announced.

With zinc as the fuel and compressed oxygen as the oxidizer, the cell operates at nearly normal temperatures and pressures. No waste products have to be removed, and the cell can be scaled up or down in size and electrical capacity to fit a wide range of applications. According to Exide, there is theoretically no limitation on the cell's physical size.

In the cell, zinc is oxidized in a potassium-hydroxide electrolyte as oxygen is admitted under low pressure. The cell can be reversed (recharged electrically) to restore full power; thus no waste products have

METALWORKING REPORT . . .

to be removed (as in other types of fuel cells).

Reportedly, the new fuel cell will last more than eight years. And in operation, there is no voltage drop as the electrode runs down. Theoretical efficiency is said to be at least double the 40% maximum of conventional engines and generators.

Exide has signed agreements with twelve makers of industrial trucks to develop an adaptation of the fuel cell for their products. A 200 amp-hr prototype will be shown at the materials-handling show in Boston in June.

MATERIALS & COMPONENTS

Reinforced Plastics

When homogeneity and uniformity are needed in a fiber-polymer system, forming from a water dispersion can be very useful. This process, called "beater-addition," is not new but it is a constant source of new, useful composite materials. Beater-addition is done in the beater used to prepare pulp for papermaking. To the dilute suspension of fibers (cellulose, ceramic, or other) in water, a resin emulsion or dispersion is added to coat individual fibers with the resin; then a sheet is formed on a paper machine. Extremely dilute suspensions produce a highly homogeneous blend of fiber and resin, ready for molding.

Very thin, uniform plies of fiber and resin are continually wound on a mandrel and the sheet is removed when the desired thickness is attained. Thus, a molded sheet 1/16 in. thick may consist of 40 to 60 laminations. For over 50 years, this method has produced electrical insulation for motors and transformers.

Machining this structure is easier than machining resin-saturated-fabric materials because individual fibers, rather than bundles of fibers, are cut. Surfaces ground to within two wavebands of helium have been produced with a ceramic-fiber reinforced Teflon.

Rogers Corp, Rogers, Conn, uses this process to supply material for electrical insulation, gaskets and seals, and for high-temperature components. With Teflon or Viton A, such fibers as glass, ceramic, or asbestoes offer unique properties. Cellulose fibers plus Buna-N provide a gasket material with high tear and bursting strength.

Double Open-Hearth Output

Oxygen-fuel lances plus burned lime, instead of limestone, have succeeded in doubling the hourly tonnage output of open-hearth steel at the Ford Motor Company's steel mill. Two furnaces were used in the research, and the technique is still considered experimental, with results best described as spectacular. A 200-ton furnace originally required 9½ hr to produce a batch of steel. Use of oxygen cut this time to 6 hr. Now, with oxygen-fuel lances (which produce extremely high temperatures by introducing both fuel and oxygen into the batch) plus burned lime, 200 tons of steel are produced in three hours. A 400-ton furnace has produced 100 tons of steel per hour.

The furnace is charged with burned lime and scrap, with the oxygen-fuel lance in operation. As soon as the initial charging operation is complete, molten iron is added—about one-half hour after the start rather than two or more hours. Then the fuel in the lances is shut off, allowing conventional end-firing burners plus the heat of reaction and the flow of oxygen to refine the steel.

MANUFACTURING CONTROL

Recorder for Remote Areas

Operating from 12-v batteries, a new portable recorder (called the Perfograph) is built to operate in remote or hard-to-get-to areas. Its record is a small, width paper tape, perforated electrically.

A product of Advanced Instrument Corp, the recorder can put on tape a wide variety of industrial variables. Company manufactures a line of transducers that feed the recorder, also make a special tape reader that transfers data from the paper tape to standard 1-in. computer tape. The reader reputedly licks the dust problem, long a bugaboo in miniature paper tapes. The recorder costs $400; tape reader costs $2300.

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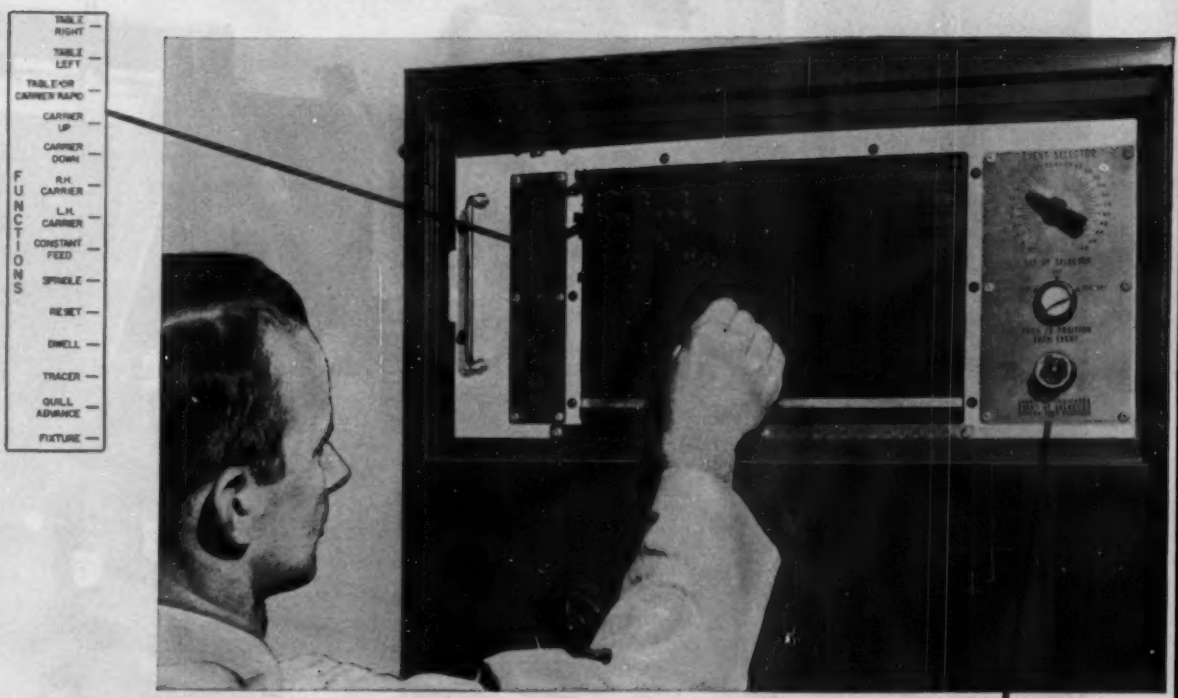

Cost advantages of automatic cycle milling now are available for smaller lots than ever before. New CINCINNATI Telematic Control is the answer. This new type of control is simple to use and versatile beyond imagination.

The operator programs all automatic functions of the cycle by merely inserting plugs in a panel board. If desired, a mask can be made for repeat jobs, exposing only the necessary holes. In addition to controlling all functions or movements of the machine table and spindle carrier, Telematic provides for auxiliary operations such as fixture clamping or indexing. A row of 24 holes opposite each machine function allows the operator to plug in complex automatic cycles involving up to 24 events. Additional panels, like the two-unit illustrated, can be supplied.

Telematic is the newest, most versatile and simplest of the operator controlled programming methods. Turn the page and see how it is applied to the new CINCINNATI 100 and 200 Series HyPowermatic Milling Machines. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

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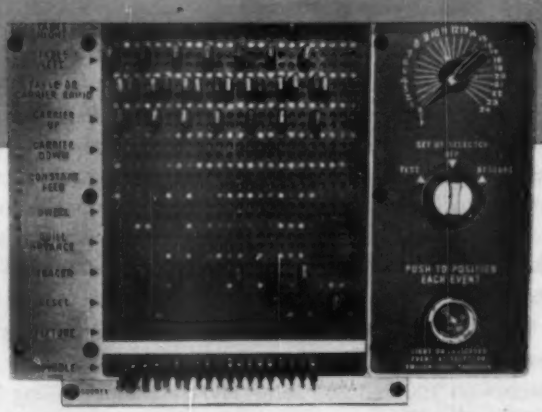

Above: AUTOMATICALLY MILLING two different parts to demonstrate the complex milling cycle which can be programmed on a 200 Series Tracer Controlled Hy-Powermatic. Complete program is set up by merely plugging in the various events on the Telematic control panel. A 24-event board is illustrated at right.

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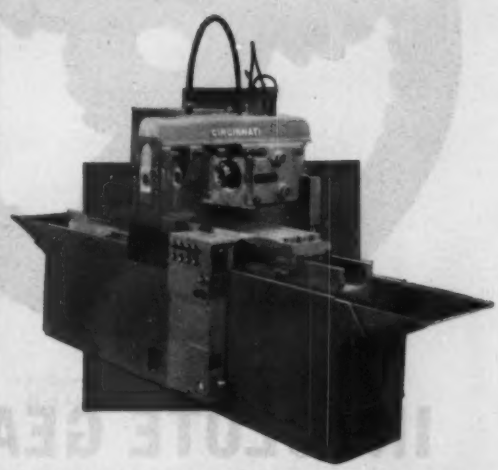

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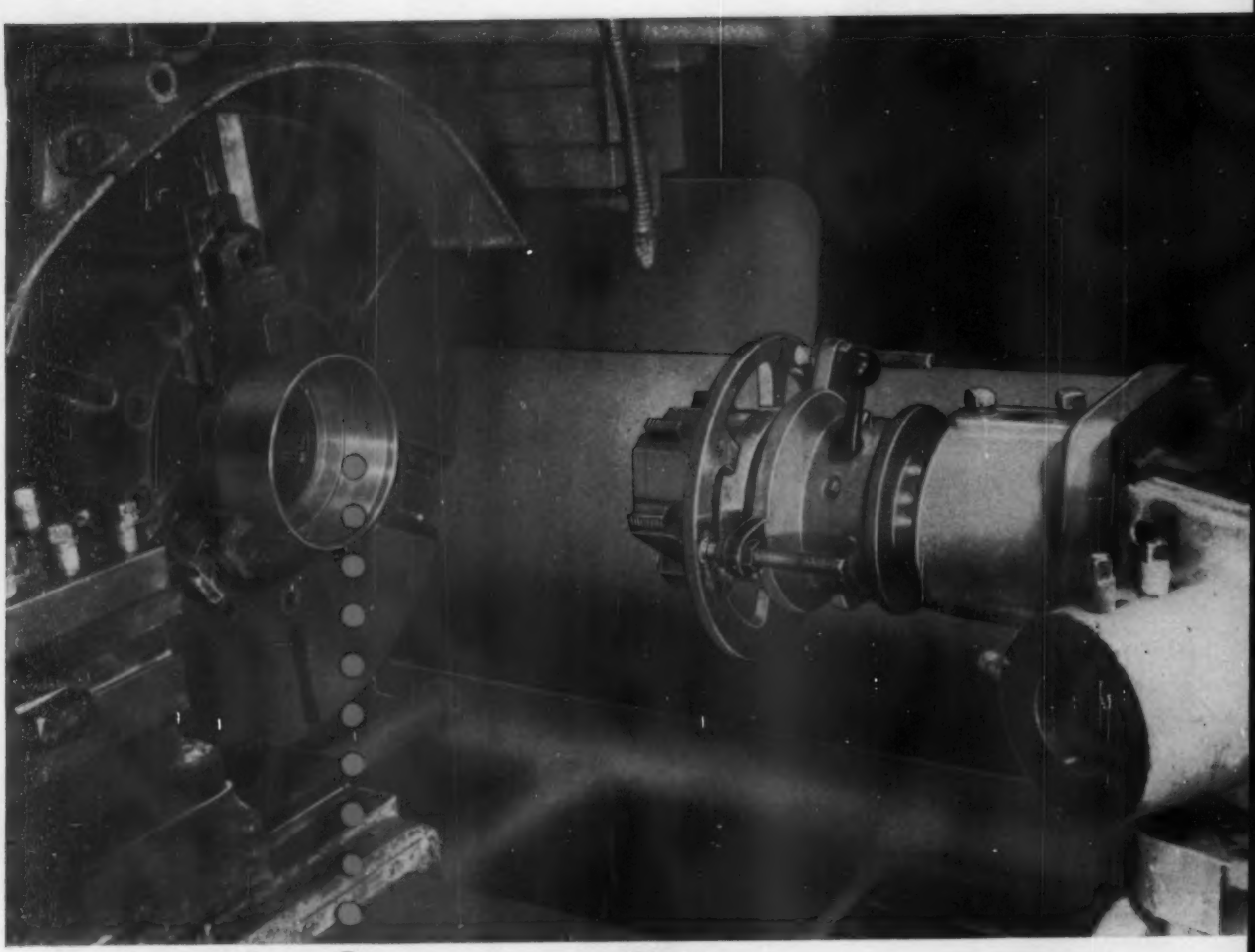
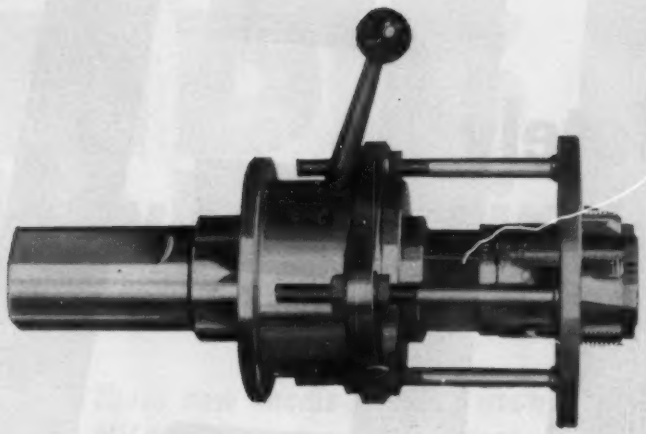
THE PRECISION LINE

Fellows Gear Production Equipment



tapping 7-5/8" threads in tough steel



Rugged construction, allowing heavy metal removal in one pass, is one of the reasons a LANDIS Collapsible Tap is used to thread cylinder retainer caps for heavy duty hydraulic cylinders at the Cleveland Hydraulic Co., Bedford Heights, Ohio.

A LANDIS 6ALT Tap with a 7″ head is mounted on a turret lathe for threading 40-50 carbon cast steel normalized from 1600° to 1750°. 7⅝″ 8-pitch UN threads are tapped 2$\frac{3}{16}$″ long to Class 2 fit.

Another outstanding feature of the LANDIS ALT Collapsible Tap is the detachable head, permitting the use of tap heads of various sizes and capacities on the same tap body. For example, on the 6ALT illustrated, five heads will allow a threading range 6½″ to 13¼″. In addition, each tap head has a relatively wide threading range — the 7″ head shown here threads all diameters from 6½″ to 8″. Thus, as a result of the minimum equipment required for such wide range coverage, low initial cost and continuing economy of tooling are assured.

LANDIS ALT Taps may also be used to produce taper threads, with chasers cutting across their entire width if required. For more complete information on the various sizes of ALT Taps for threading all diameters from 1¼″ to 13¼″, write for Bulletin G-94.

499C

the world's largest manufacturer of threading equipment

LANDIS *Machine* COMPANY

WAYNESBORO · PENNSYLVANIA

CUTTING · GRINDING
ROLLING · TAPPING

MMT-PE
BOOTH NO. 432

completely
NEW
LANDIS
LANDISTOOL

LANDIS
multiple wheel grinder
precision to tenths *consistently*... lower units costs

These new Landis features assure MORE production

MICROFEED... cancels grinding feed variables—automatically

FRONT-OF-WHEEL DRESSING . . . dresser travel parallel to work centerline is assured

AUTOMATIC WORK RESTS . . . positive work support for better roundness and size control

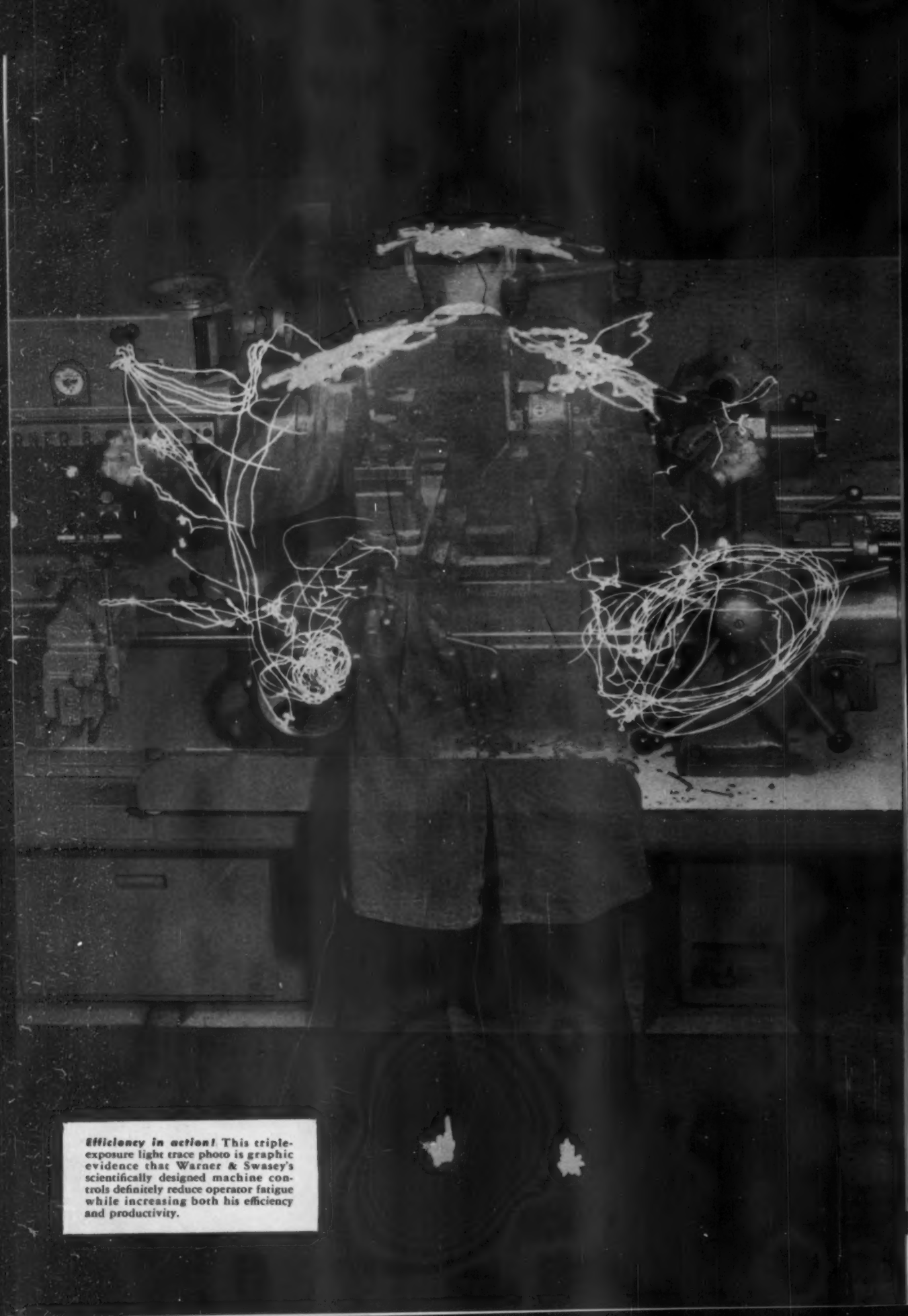
NEW BED DESIGN . . . one-piece casting for accurate ways relationship

NEW FOOTSTOCK . . . preloaded ball sleeve for shake-free support

Four main bearings of a cam shaft being ground in one operation. Production is 65 complete shafts per hour, removing .015" stock at .0005" tolerance.

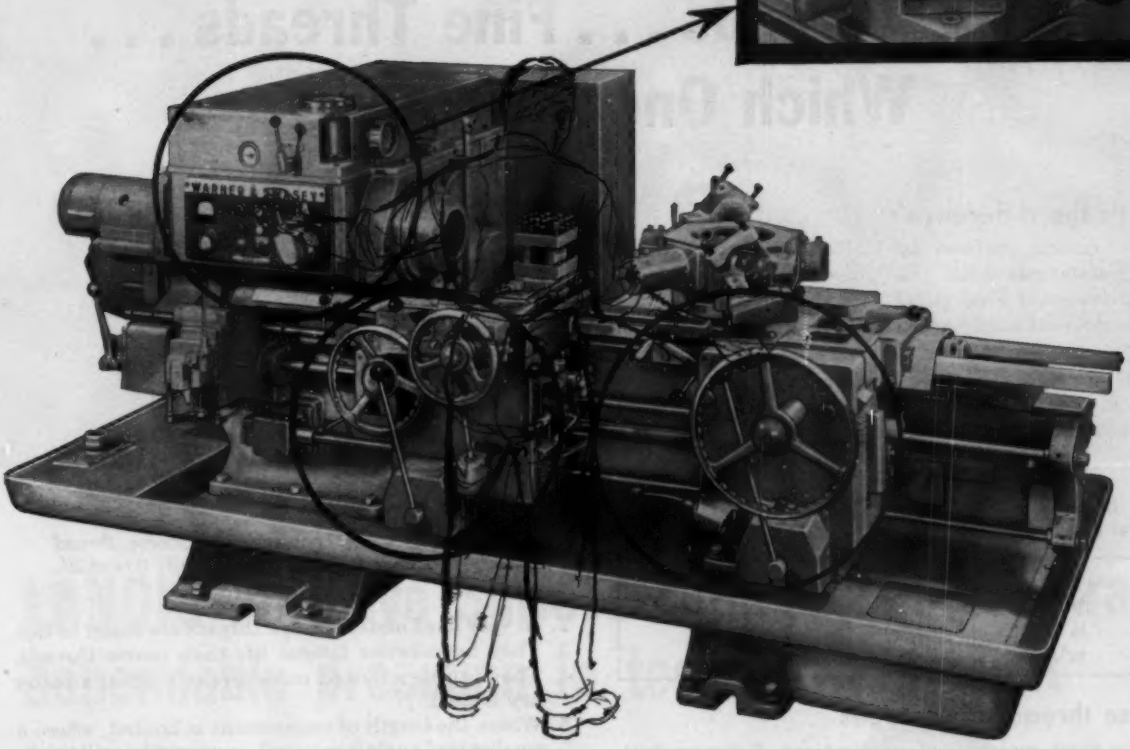
precision grinders

LANDIS TOOL COMPANY
WAYNESBORO, PENNSYLVANIA



Efficiency in action! This triple-exposure light trace photo is graphic evidence that Warner & Swasey's scientifically designed machine controls definitely reduce operator fatigue while increasing both his efficiency and productivity.

This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.



Warner & Swasey Zoned Controls boost production by increasing operator efficiency

Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching — all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector — calibrated in surface feet and spindle RPM's versus work diameters — that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

FASTENEERING

TIPS ON FASTENER APPLICATIONS BY STANSCREW

Coarse Threads . . . Fine Threads . . . Which One . . . When?

What's the difference?

Coarse threads conform to Unified National Coarse (UNC) standards while fine threads are governed by Unified National Fine (UNF) standards. Both include precise, detailed specifications for all thread dimensions and proportions.

UNF standards specify substantially more threads per inch. The following table illustrates the range of difference in various diameters.

Diameter of Fastener	UNC Threads Per Inch	UNF Threads Per Inch
¼"	20	28
⅜"	16	24
½"	13	20
¾"	10	16

Coarse thread advantages

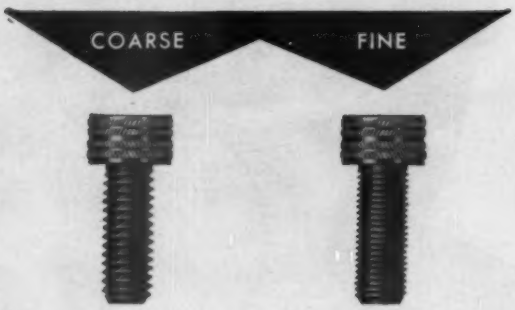
For the great majority of applications, fasteners with coarse threads are used because of these advantages:

1. They assemble easier and faster . . . provide a better start with less chance of cross threading.
2. Nicks and burrs from mass handling are less liable to affect assembly.
3. More clearance provided for plating.
4. Less liable to seize in temperature applications and in joints where corrosion will form.
5. For threading into lower strength materials, coarse threads are less prone to strip.
6. Extreme difficulties are encountered in attempting to tap fine threads in brittle or friable material.

Fine thread advantages

In some applications, fine threads provide a superior solution because of these advantages:

1. They are some 11% stronger than coarse threads due to greater cross-sectional area.



Two ⅜" x 1" socket cap screws. Coarse thread (UNC) has 16 threads per inch; fine (UNF) thread 24.

2. In very hard materials, fine threads are easier to tap.
3. They have better fatigue life than coarse threads.
4. They can be adjusted more precisely when a cotter key is used.
5. Where the length of engagement is limited, where a smaller lead angle is required, or where the wall thickness requires a smaller thread, fine threads should be used.

Don't overload inventory

In trying to establish the best possible fastener for each application, don't stock too many fasteners and overload your inventory. A good rule of thumb is "one thread for a given size and grade of fastener" . . . choosing the type of thread which is best for all applications involving that size and grade. In many cases this will boil down to a coarse thread, since the group will probably include a tapped hole in a friable or low strength material.

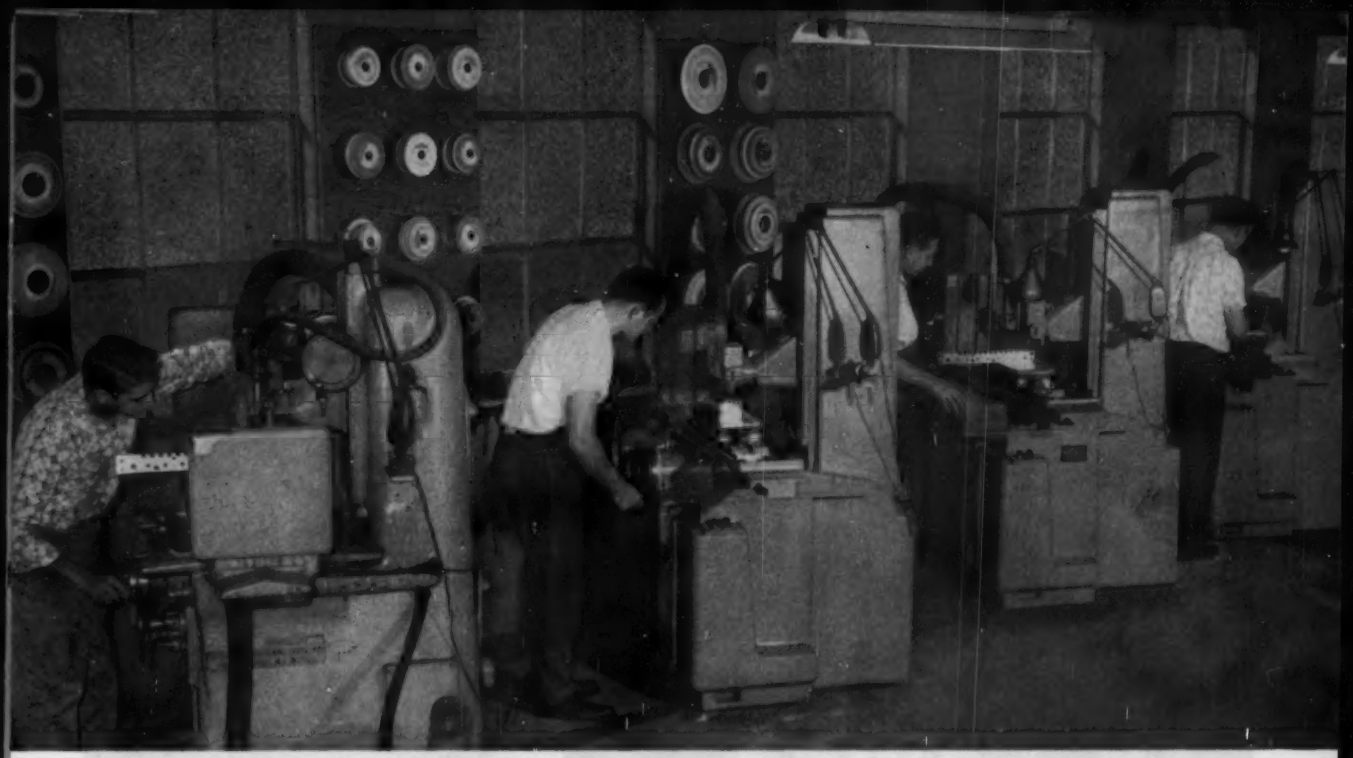
For further information

For more detailed information, or the answer to a specific problem, call in your Stanscrew fastener specialist. He is quickly available through your local Stanscrew distributor . . . also your source for Stanscrew's complete line of over 5,500 different types and sizes of dependable fasteners.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois



Four Landis Abrasive Surface Grinders in operation at the Progressive Tool Company, York, Pennsylvania

LANDIS Abrasive Surface Grinders demonstrate dependable precision in tool and die plant

Grinding the punch holder of a progressive die on a Landis Abrasive 618. Tolerances are as low as ±.0001".

At Progressive Tool Company, grinding is their largest operation. In this modern plant, four Landis Abrasive surface grinders are used for a wide variety of precision operations on tools, dies, gauges and special machine parts. Progressive reports complete satisfaction with the ease of operation and accuracy of these machines.

ABRASIVE

precision surface grinders

a product of

LANDIS TOOL

world's largest manufacturer of precision grinding machinery

WAYNESBORO, PENNSYLVANIA

OK, OK...SO YOU HAVE THE SECRET TO BETTER PUNCHING AT LOWER COST...WHERE HAVE I HEARD THAT BEFORE?

Skeptical? Must be you've never seen an all-electric impact hammer in action. Consider Black & Webster Model C — ***ELECTRO PUNCH*** for quality staking and punching. Up to 5 tons impact, up to 75 times a minute. Stakes for you, punches for you, rivets for you, marks for you, stamps for you . . . saves money for you. Better still — earns money for you. How? Operates more thriftily. Easier on utilities. Averages 44,000 strokes on just one kilowatt hour of juice. Doesn't disturb air lines, of course. Just plug it in and punch. Operators like it—choice of simple hand, foot or automatic switch operation. Or, completely automatic. Price? Management hesitates to mention it — buyer might be skeptical, they say. Permitted to say this: Cost is lower than for any comparable equipment. Worth investigating? Hope you'll think so.

BLACK & WEBSTER, INC. Dept. 3, 570 Pleasant St., Watertown 72, Mass.
PHONE: WALNUT 6-0100

MODEL C/IMPACT 5 tons
Specifications

Length of Stroke	2"
Cycles per minute	75
Maximum Shut Height	6¼"
Frame height	19"
Tool Hole in Spindle	.625-.627 x 1" deep
Throat Depth	4½"
Bench space	7⅞" x 12"
Weight	90 lbs.
Power Consumption	44,000 strokes for 1 KWH

115V., or 230V, AC, 50-60 cycle, 1 phase

For every foundry—best news in years!

Norton Resinoid Wheels Now Better Than Ever

Norton Foundry News

NORTON

BETTER SNAGGING WHEELS!

B11 Wheels BN Wheels BD Wheels

Equipment and quality control in new, multi-million [illegible] modern — maintaining

The great new Norton Worcester Plant No. 8 was built specifically to advance the manufacture and performance of resinoid wheels — the wheels foundries need and use most.

Norton Foundry News

Norton Foundry News

BIG NEW PLANT FOR RESINOID WHEELS!

Equipment and quality control in new, multi-million dollar Plant No. 8 are ultra-modern — maintaining "Touch of Gold" performance at highest efficiency and producing resinoid wheels that remove more metal per dollar and last longer. For example:

- B11 resinoid bonded wheels have more uniform structure and better balance, assuring faster, cooler grinding, plus smoother operation. Available in sizes and types for all jobs — on your swing frame grinders and floor stands down to smallest portables.
- BN and BNA straight wheels, reinforced with glass cloth, are strong and safe, excellent for cutting and notching gates and risers. Made in thinnesses down to 1/16" and 3/32".
- BD and BDA wheels, raised hub type, glass-nylon reinforced, are ideal for many cleaning, slotting and cutting operations.

On-the-job reports of how new Norton resinoid wheels are paying off in ferrous and non-ferrous foundries are in the new report, Norton High Speed Resinoid Wheels for the Foundry, shown here. Your copy is available from your local Norton Representative . . . and is as near as your phone. Call for it today. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON ABRASIVES

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75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEBB-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

CIRCLE 168 READER SERVICE CARD

CIRCLE 169 READER SERVICE CARD ►

Precision and Versatility for Short Runs

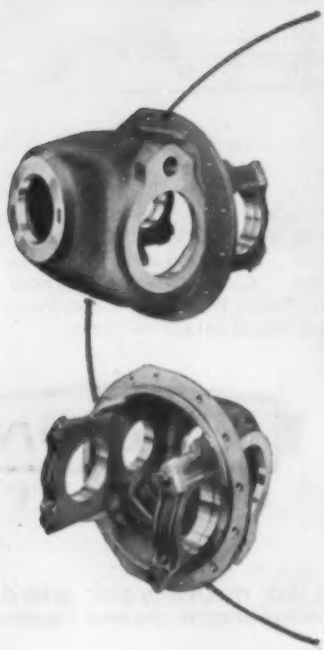
New Cross Precision Boring Machine for Differential Carriers

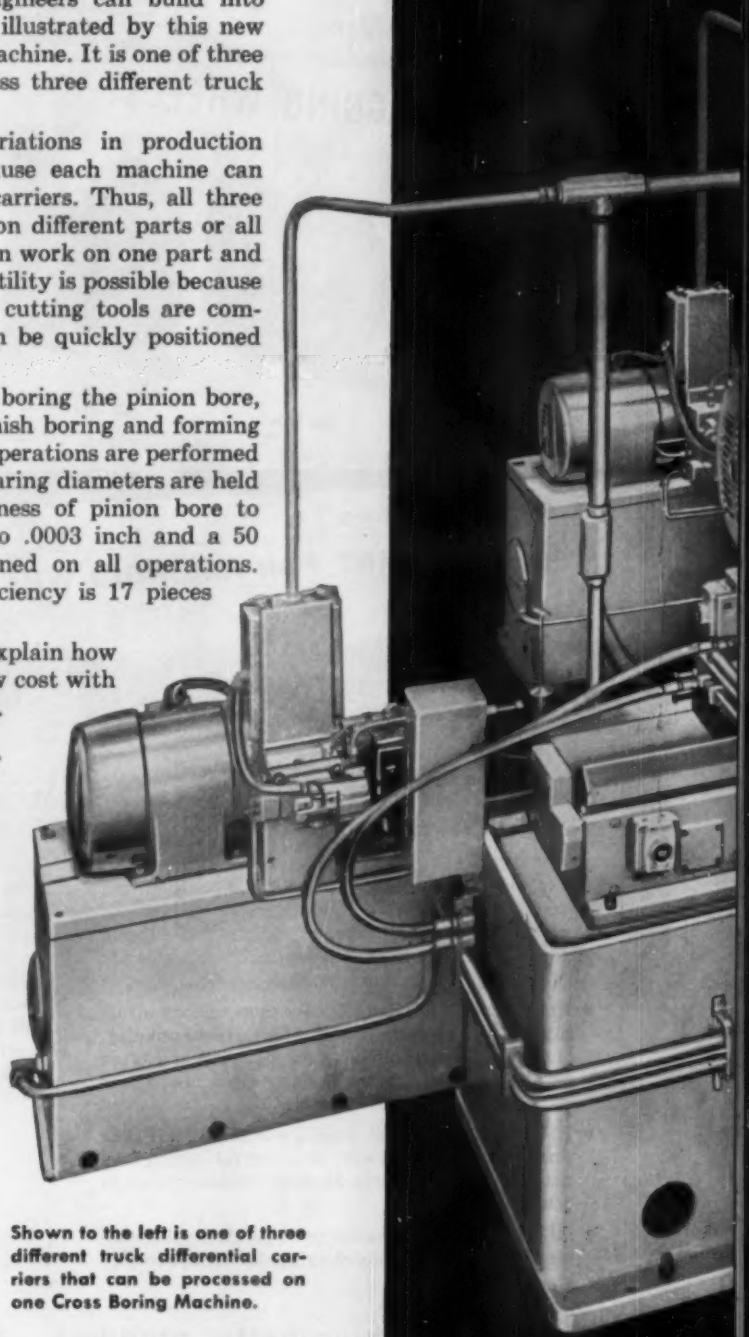
The versatility that Cross engineers can build into automation equipment is well illustrated by this new Three-Way Precision Boring Machine. It is one of three similar units designed to process three different truck differential carriers.

Unusual flexibility for variations in production requirements is provided because each machine can process any one of the three carriers. Thus, all three pieces of equipment can work on different parts or all can work on one part or two can work on one part and the third on another. This versatility is possible because the fixtures, boring heads and cutting tools are completely interchangeable and can be quickly positioned for each carrier.

Processing consists of finish boring the pinion bore, finish facing the pinion boss, finish boring and forming grooves in the cross bores. The operations are performed to a high degree of precision. Bearing diameters are held to less than .001 inch, squareness of pinion bore to pinion mounting face is held to .0003 inch and a 50 micro inch rms finish is obtained on all operations. Rated production at 100% efficiency is 17 pieces per hour.

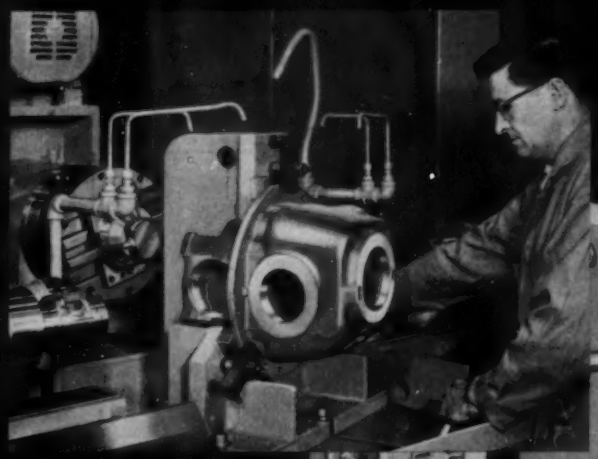
Let a Cross Sales Engineer explain how you can do precision work at low cost with versatile automation equipment.





Shown to the left is one of three different truck differential carriers that can be processed on one Cross Boring Machine.

Another Automation First by Cross



The work-holding fixture is mounted on a precision index table which rotates 180 degrees for easy loading and unloading.

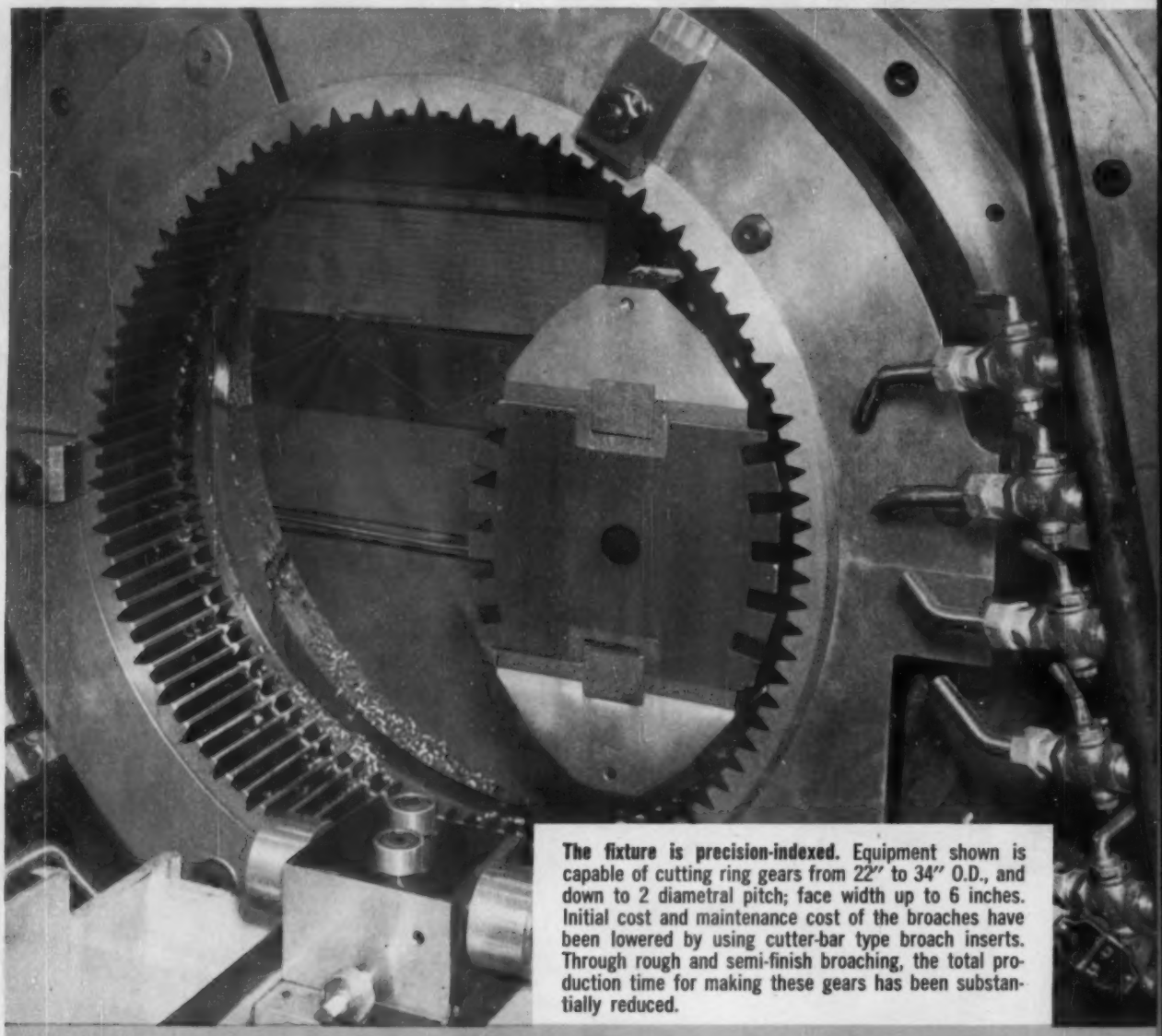
Established 1898

THE **CROSS** CO.

First in Automation

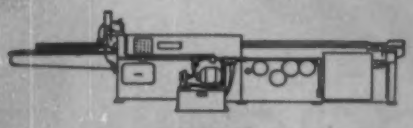
PARK GROVE STATION • DETROIT 5, MICHIGAN

PRECISION BROACHING of this large internal ring gear at a fast, high-production rate is easy on this 25-ton LAPOINTE

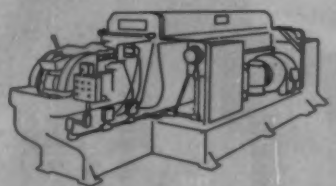


The fixture is precision-indexed. Equipment shown is capable of cutting ring gears from 22" to 34" O.D., and down to 2 diametral pitch; face width up to 6 inches. Initial cost and maintenance cost of the broaches have been lowered by using cutter-bar type broach inserts. Through rough and semi-finish broaching, the total production time for making these gears has been substantially reduced.

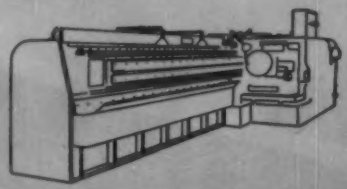
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

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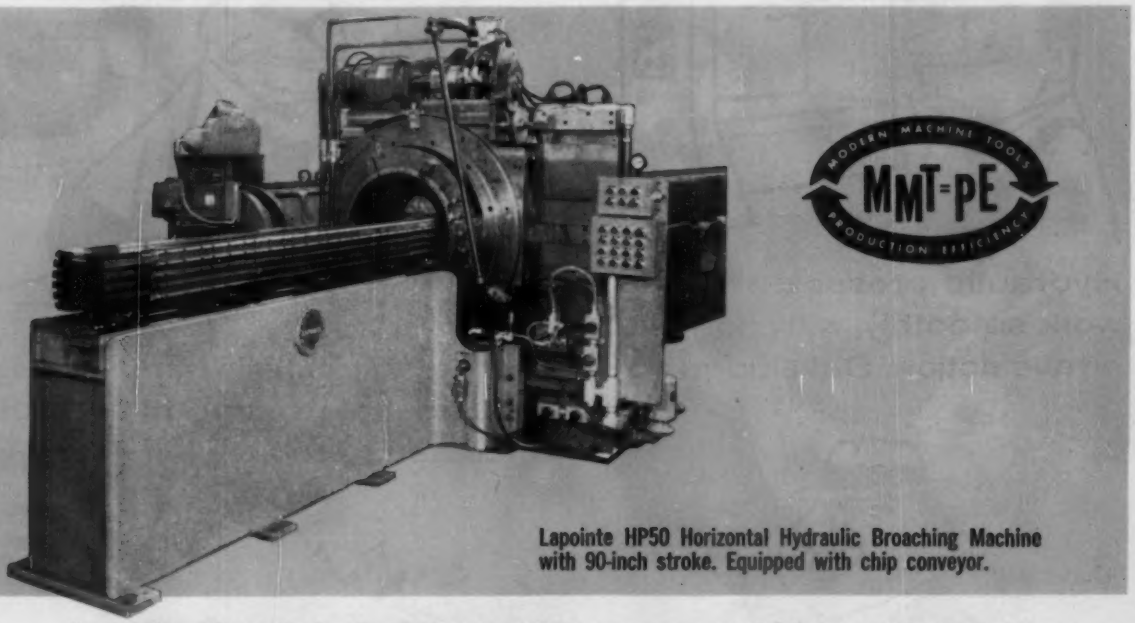
— BROACHING MACHINE



Lapointe HP50 Horizontal Hydraulic Broaching Machine with 90-inch stroke. Equipped with chip conveyor.

Comparing all methods of metal removal, the greatest potential for cost reduction exists in the field of *broaching.*

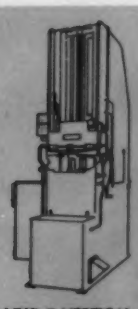
That's a challenging statement, but here's one proof that it's true: this big ring gear with more than 100 teeth is Lapointe-broached in 32 minutes, floor-to-floor time! The operator merely loads and unloads the parts . . . the broaching cycle is completely automatic, the indexing fixtures operate automatically, and the machine stops automatically after broaching all teeth.

It may be to your advantage to consult us about some of your own metal-removal problems. We design and build the broaching machines, the broaching fixtures, and the broaches. We can take full responsibility for the entire broaching operation, backed up by nearly sixty years of experience in broaching. Why not investigate?

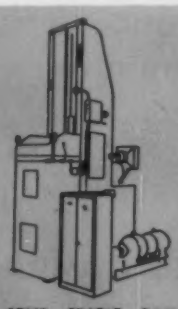
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

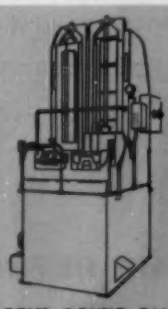
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

Hydraulic presses should work smoothly, with no jerk or erratic action. But sludge and varnish in an Eastern plant's presses caused uneven operation, with increasing "rejects."

A Sinclair lubrication engineer recommended Sinclair's new DURO hydraulic oils with oxidation, rust and foam inhibitors.
Result: outstanding performance, with "rejects" cut to minimum.

Let Sinclair tackle (and solve) your plant problems. Call your local representative or write...

Sinclair

SINCLAIR REFINING COMPANY

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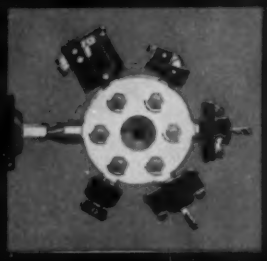

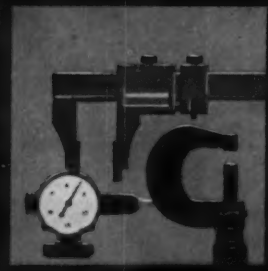

make more for less

Brown & Sharpe

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MMT-PE

MACHINE TOOL
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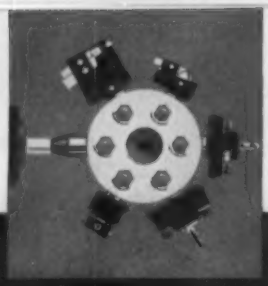
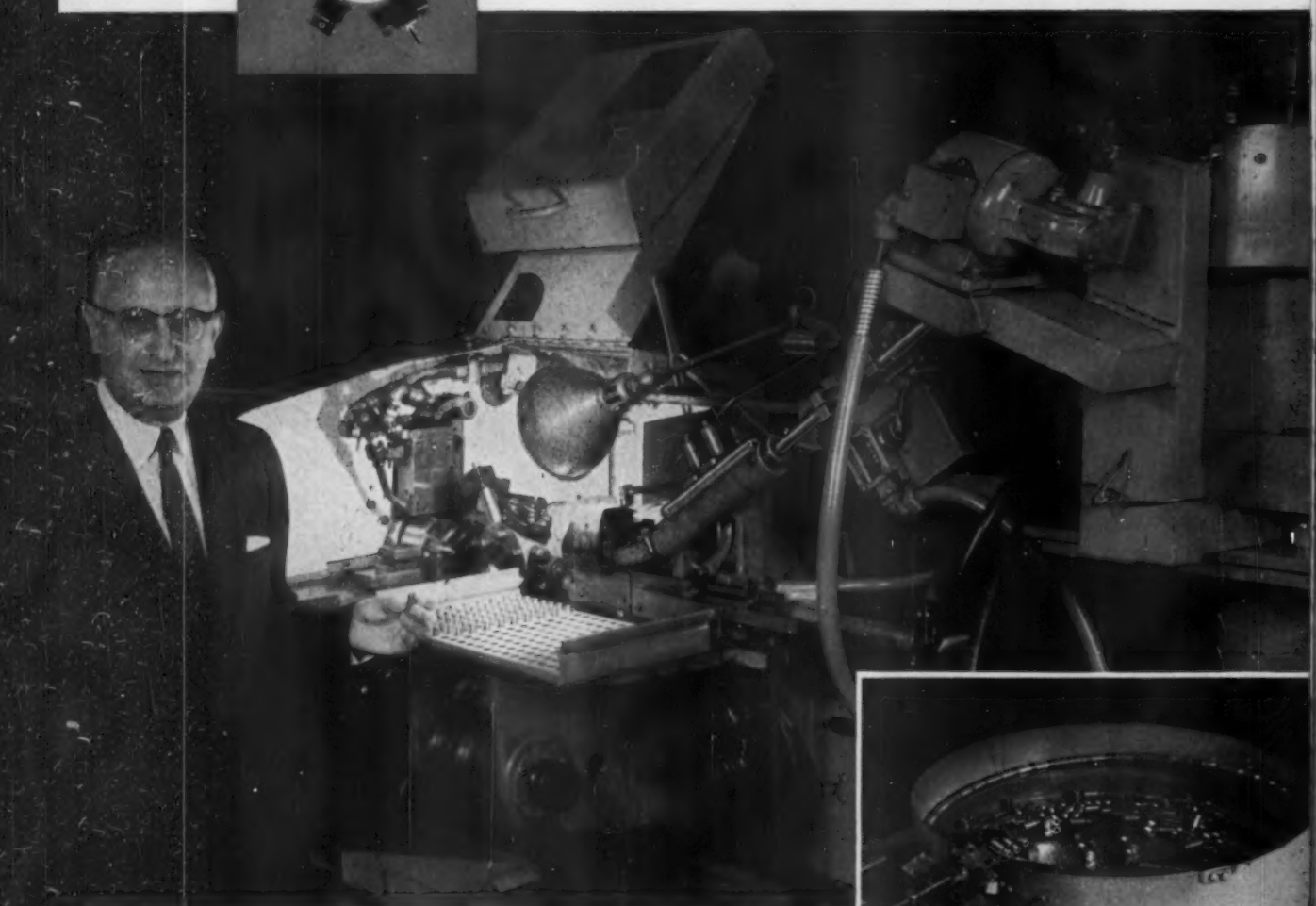
Booth 452
Machine Tool
Exposition



TO HELP YOU REDUCE SCREW MACHINE PRODUCTION COSTS



Parts are delivered in continuous flow through tube from hopper to spring-loaded bushing mounted in one port of turret. Bushing carries part 180° and delivers it to opened Skinner Chuck in spindle, where it is held for operation cycle.

Eliminates manual loading—reduces cycle time 10% with Brown & Sharpe Automatic Turret Loading Arrangement

"Our second operation net production compares favorably, with bar work on machines with automatic bar loading," says Cornelius M. Woog, Manager of Manufacturing Engineering; The Skinner Chuck Company and Skinner Electric Valve Division. "The B&S Hopper Feeder eliminates the disadvantages of cross slide chute loading."

Hopper feeding is fully automatic, with a big saving in operators' time. The customary interference allowance is eliminated. On some jobs, the time required for other loading methods can be reduced 50%.

More operations can be performed in a shorter time cycle, since both cross slides, and for most work, five turret ports are available for tooling. For the job illustrated, the cycle time saving was 10%.

The Brown & Sharpe Automatic Turret Loader is a standard, self-contained unit, readily adaptable to a variety of work. Change-over usually takes less than 30 minutes.

For use with B&S No. 2 Automatics, the arrangement takes work up to 1¼" diameter and 4¼" length. Models for other sizes of B&S Automatics will be available soon.

Send samples and prints for application study and report of your potential savings on second operation costs. Write: Machine Tool Division, Brown & Sharpe Mfg. Company, Providence 1, Rhode Island.

Brown & Sharpe PRECISION CENTER

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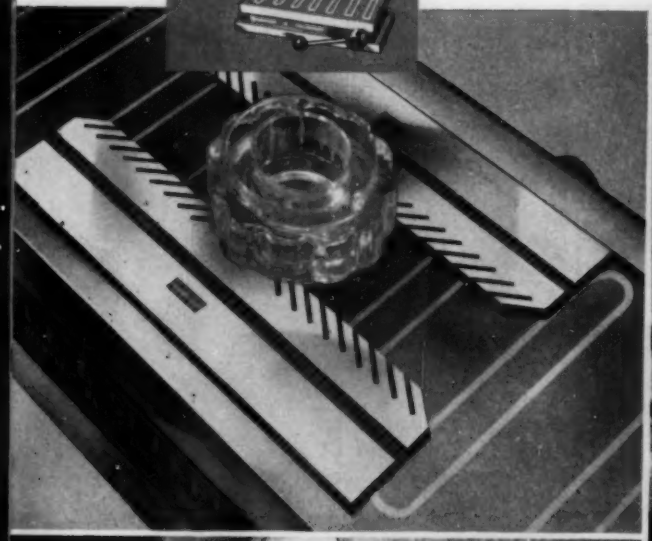
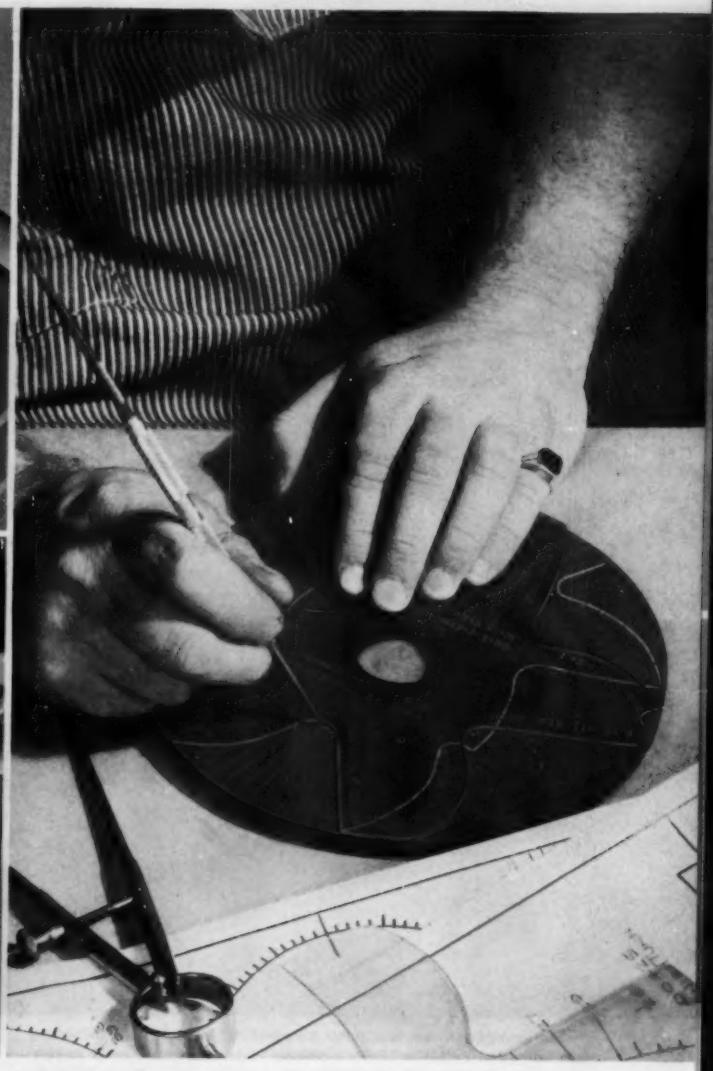
MMT-PE

Booth 452
Machine Tool
Exposition

TO HELP YOU GET MORE FROM MACHINE TOOLS





3 new time-savers from Brown & Sharpe's complete accessory and screw machine tool line

1. New Brown & Sharpe Perma-Clamps make it easy to clamp non-magnetic work on magnetic chucks. Slightly raised, spring-mounted jaws are just placed against each side of the work. They are pulled down, to wedge the work tightly between them, when the chuck is turned on.

2. New B&S Adjustable Knurl Holder No. 185 with its exclusive quick-change feature saves you up to 15 minutes' time when changing or adjusting knurls. New capacity allows more work to be done with existing machines.

3. New B&S pre-colored cam blanks save up to 75¢-worth of preparation time per blank. They're ready for instant layout; there is no de-greasing, dyeing or drying.

Brown & Sharpe is constantly coming up with new ideas in tooling — to help you get more, for less, from your machines. Be sure you have the latest cost-saving information on this complete line. Write for Machine Shop Accessories Catalog 37A and Screw Machine Tool Catalog 37S. Brown & Sharpe Manufacturing Company, Providence 1, Rhode Island.

Visit our Booth No. 452 at the Machine Tool Exposition in September

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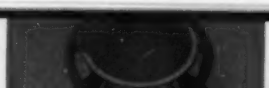

TURRET DRILLING MACHINES

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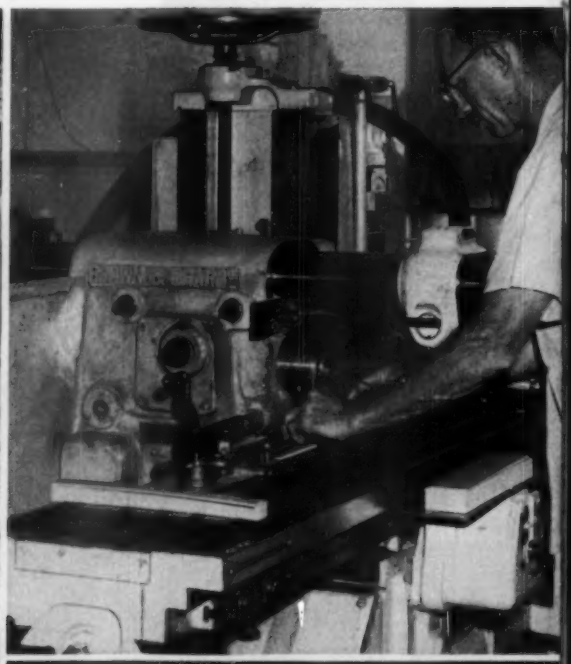
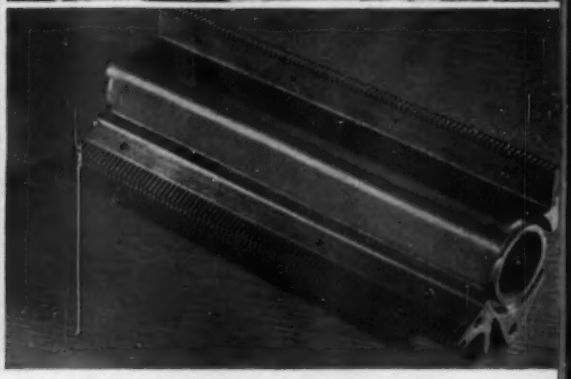
TO HELP YOU MILL MORE FOR LESS





International Business Machines Corporation has steadily increased installations of B&S No. 12 Plain Milling Machines, based on a 20-year experience. Department managers rely on their easy adaptability to the wide variety of work machined, and the exclusive features which permit safe, fast climb-milling cuts to the close tolerances and surface quality essential in parts for IBM products.

No. 12 installations at the Endicott plant include — (left) a production line of 3 HP machines, and (upper right) a 7½ HP machine. The part shown, with 80 slots in four rows, is typical of many complex shapes produced by climb milling, with high efficiency, in simple fixtures.

At IBM - climb-milling efficiency of B&S No. 12 speeds production - meets high precision standards

Climb-milling in either direction — to full overload capacity — is completely safe on the No. 12 Plain Milling Machine. With the B&S backlash eliminator, milling setups can take full advantage of the extra high cutting loads now practicable with high speed and carbide cutters, without risk of damage.

You can make full utilization of the wide choice of milling cycles provided. Thin, narrow, or irregular shapes can be held in simple fixtures, and climb milled with maximum feeds.

All the operating features you need for fully automatic milling are standard in the B&S No. 12. With special fixtures, you can get the productivity of an expensive, single-purpose machine. Your investment is lower, and you retain the unlimited adaptability of the basic machine. It can easily be converted for revised operations or other jobs.

Brown & Sharpe milling specialists will survey your operations and show you how to get the most production per dollar invested. For complete information, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

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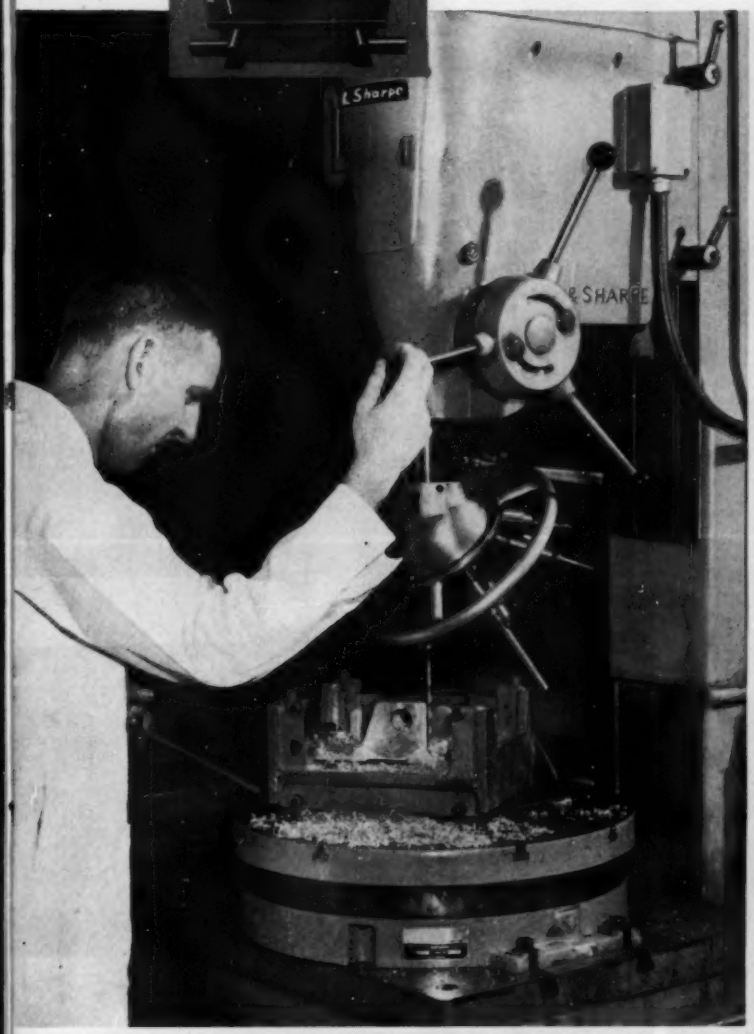
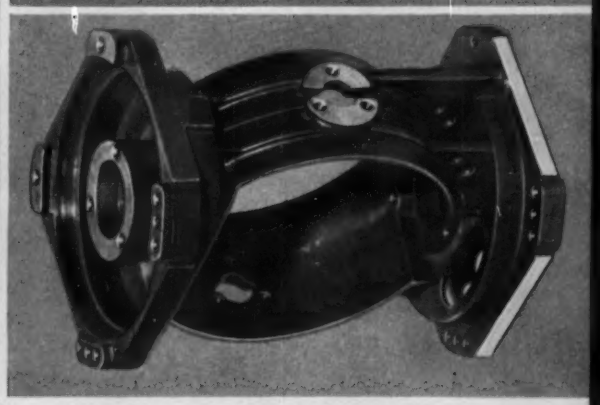
TURRET DRILLING MACHINES... TO HELP YOU DRILL MORE FOR LESS





AT WALTHAM PRECISION INSTRUMENTS CO., the base casting for a missile timing mechanism, shown in fixture mounted on B&S Positioning Table, is one of many parts machined to close tolerances with B&S Turret Drilling. Two other parts illustrate typical precision hole patterns.

In the aluminum outer gimbal for a Waltham Vertical Gyroscope (upper right) 27 drilling, tapping, and reaming operations are performed in 15 holes, in 3 planes. In the steel inner gimbal (lower right) 61 drilling and tapping operations are performed in 33 holes in 5 planes.

Instrument maker gets .001" hole locating precision– 60% time saving–with Brown & Sharpe Turret Drilling

Drilling, tapping, boring, and reaming account for a big percentage of the machining costs at Waltham Precision Instruments Co., Massachusetts manufacturer of timing devices, missile components, and other precision electro-mechanical products. Compact design calls for machining complex patterns of accurately spaced, small diameter holes.

With drilling operations a prime target for cost-reduction, Waltham makes good use of the big savings potential of the B&S Turret Drilling method. Multiple operations are performed at a single station. With the B&S Positioning Table and simple holding fixtures, accurate hole location (within .001") takes only a few seconds in each sequence. Production time is up to 200% faster than with gang-drill box jig methods.

Find out how much you can save with Brown & Sharpe Turret Drilling Machines—in work transfer and set-up time, in jig costs, in tool wear and maintenance—in capital investment and floor space. Write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

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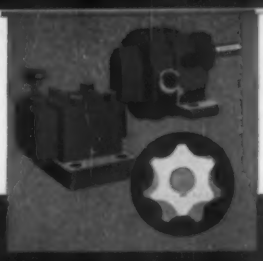
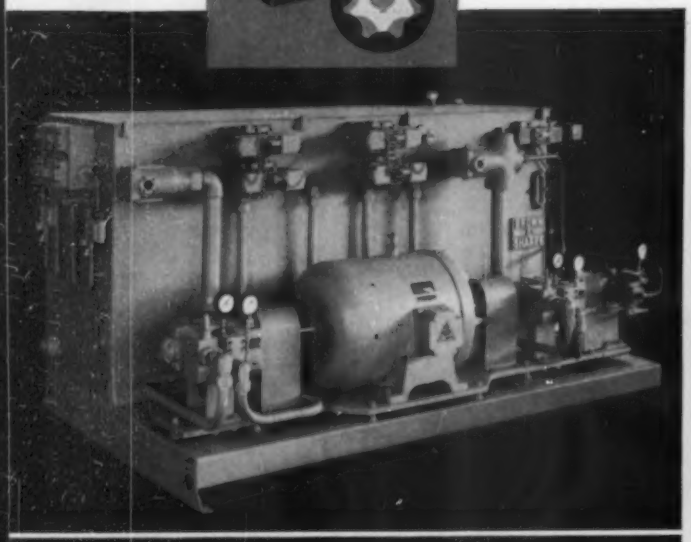
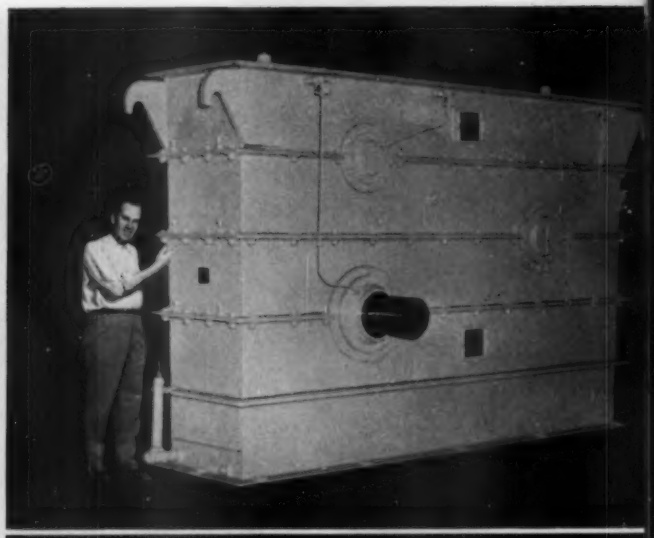
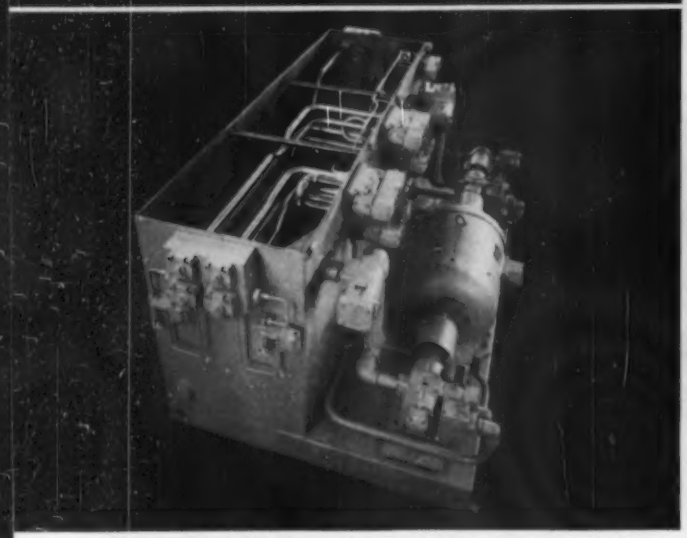
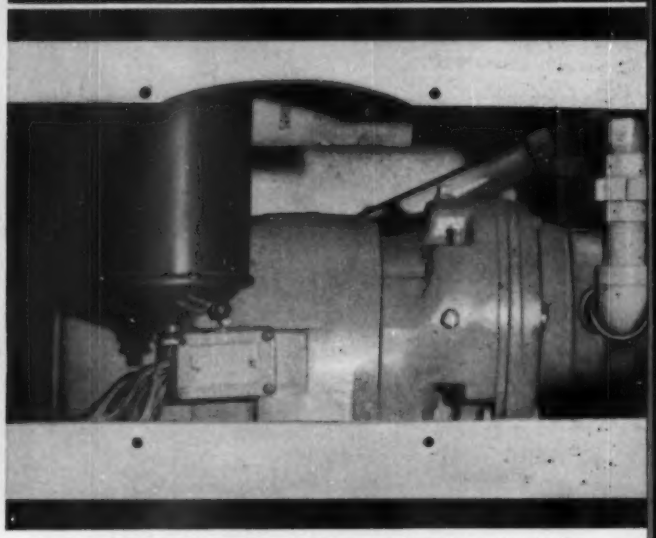


TO HELP YOU HANDLE FLUIDS MORE EFFICIENTLY... AND FOR LESS









New Circuit Master comes pre-assembled to suit your needs. Components and fluid are easily inspected — additions easily made.

Morse Chain transmission (above) will connect 758 hp engine to big flood-control pump. B&S No. 113 pump (below) lubricates transmission.

Double A announces economical new "package" for hydraulic power

This "Circuit Master" is a compact new hydraulic power unit that combines required motor, pumps, valves, reservoir and other components in a money-saving, L-shaped design.

It is economically pre-assembled of "stock" items by one responsible source — Double A. It reduces your external piping as much as 40%, and is easy to maintain.

Write for details on Circuit Master and the complete line of Double A hydraulic power units, control valves, Gerotor pumps. Double A Products Co., subsidiary of Brown & Sharpe Mfg. Co., Manchester, Michigan.

B&S Pumps help make good land out of bad in Florida swamps

Morse Chain Co. designers needed dependable, motor driven gear pumps to lubricate heavy chains, sprockets and bearings in four king-sized transmissions they are furnishing for a flood control and irrigation project.

They found their pumps on Page 29 in the Brown & Sharpe pump catalog, available for immediate delivery.

Simplify your own pump problems by writing for and using the B&S Catalog, No. 36P. Brown and Sharpe makes more pumps for more fluids than any other manufacturer! Brown & Sharpe Mfg. Co., Providence 1, R. I.

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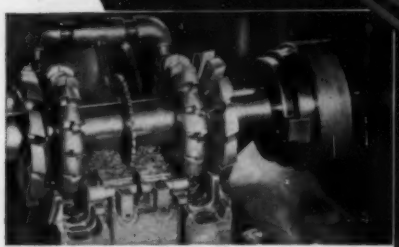
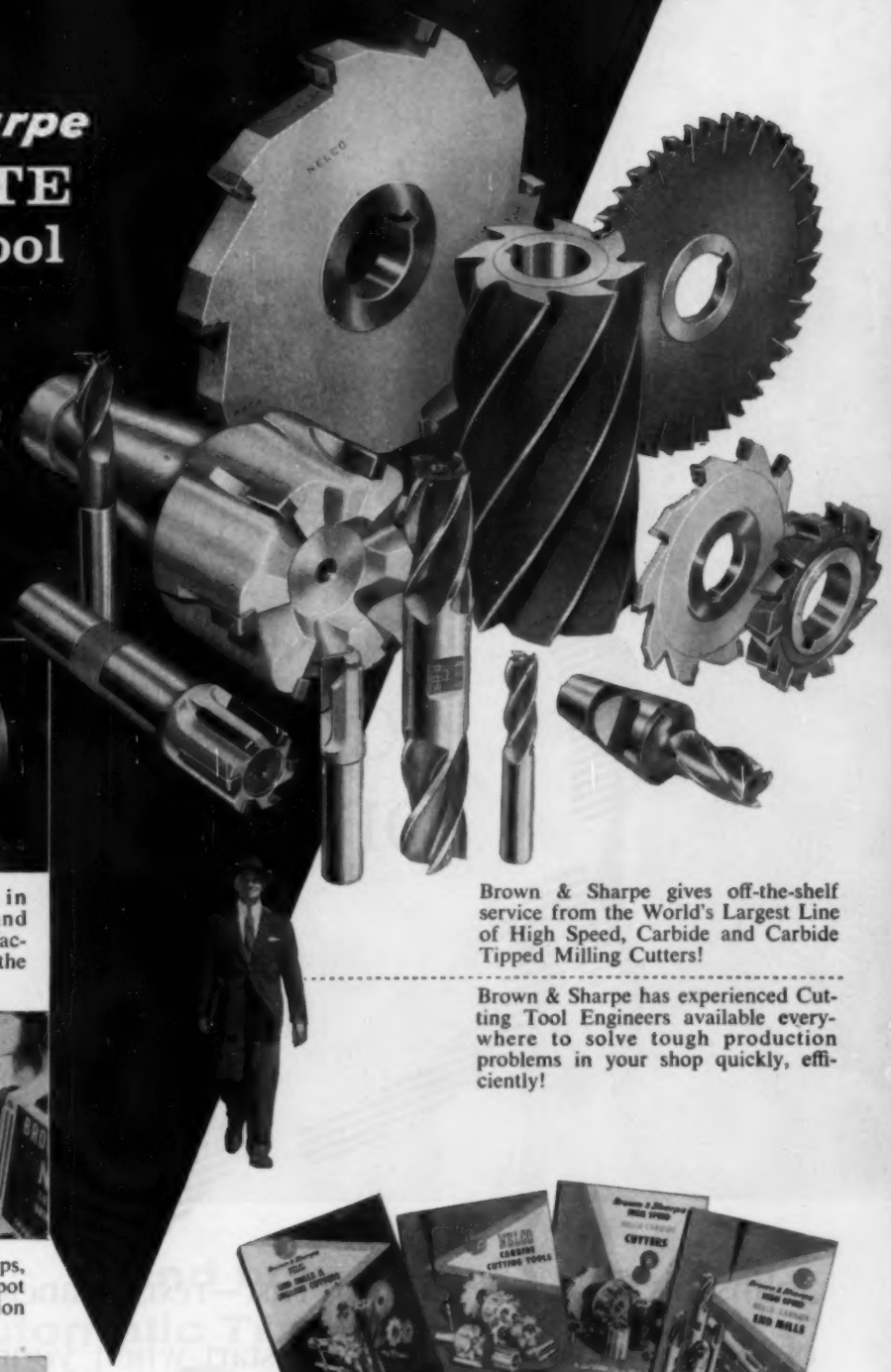
How *Brown & Sharpe* COMPLETE Cutting Tool Service Gives You EXTRAS!



Brown & Sharpe experience in "Special" milling cutter design and engineering is the result of manufacturing millions of "specials" over the past 125 years.

Brown & Sharpe Cutter Service Shops, through Distributors, give on-the-spot resharpening, repair and modification service with speed and economy!

Brown & Sharpe offers a line of reusable, sturdy packages, easy to stock, easy to ship . . . excellent protection for the *best* in cutting tools!



Brown & Sharpe gives off-the-shelf service from the World's Largest Line of High Speed, Carbide and Carbide Tipped Milling Cutters!

Brown & Sharpe has experienced Cutting Tool Engineers available everywhere to solve tough production problems in your shop quickly, efficiently!

INDUSTRIAL DISTRIBUTORS
THE JOINT HAND OF PRODUCTION

Brown & Sharpe complete cutting tool service is available through dependable Industrial Distributors everywhere in Metalworking America!

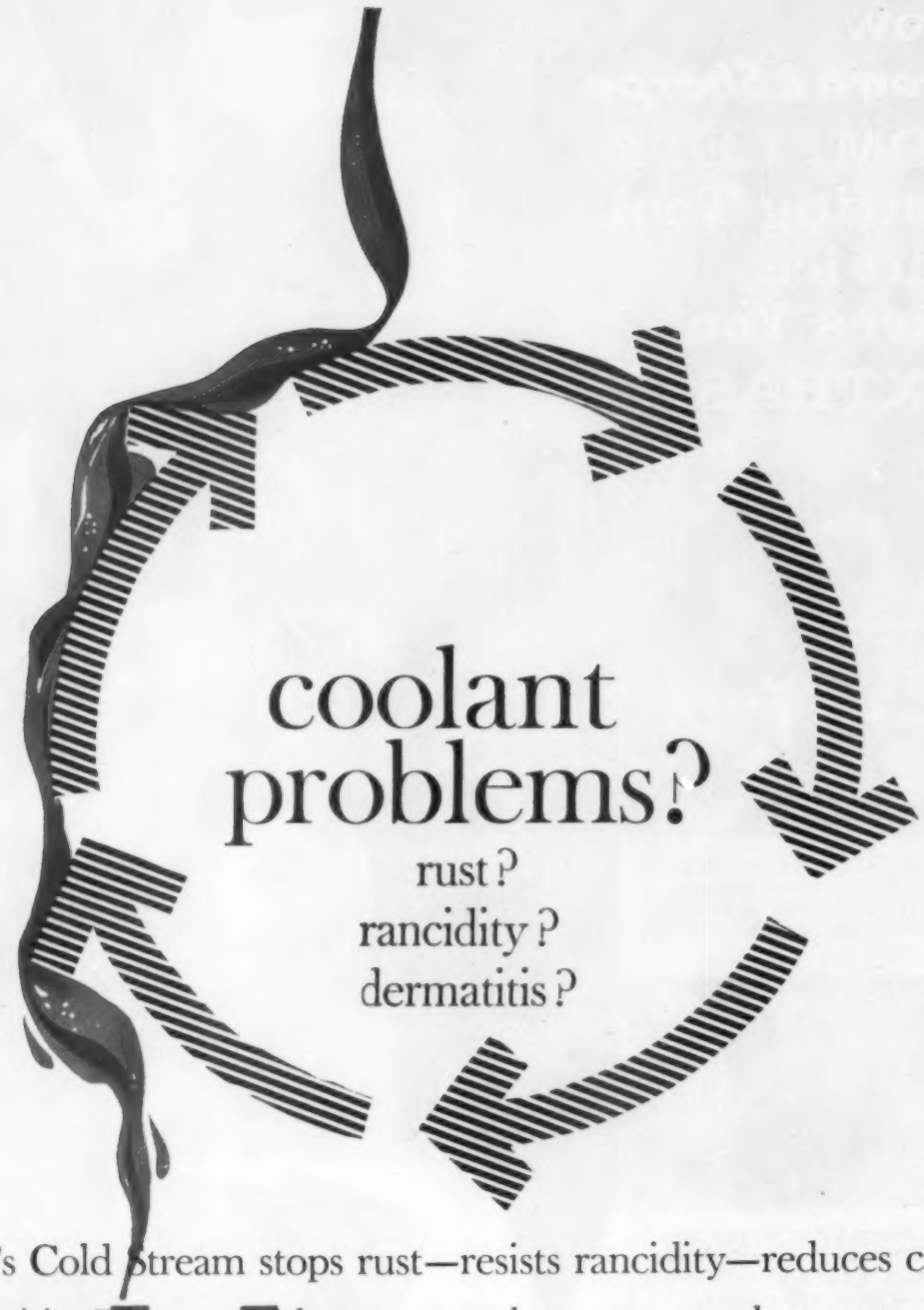
Brown & Sharpe has a NEW line of Cutting Tool Catalogs with complete Engineering Data. Information on *every* B&S Tool includes:

PRODUCTION USE MATERIALS TO BE CUT
TOOL FEATURES TOLERANCES TOOL DESIGN

Take the guesswork out of tool selection. Request your catalogs today . . . and, for EXTRAS, specify B&S Milling Cutters!

Brown & Sharpe — HIGH SPEED STEEL CUTTING TOOLS

NELCO — CARBIDE CUTTING TOOLS



coolant problems?

rust?
rancidity?
dermatitis?

Johnson's Cold Stream stops rust—resists rancidity—reduces causes of dermatitis. These problems start when your coolant gets dirty. Cold Stream stays clean week after week—even on cast iron. Cold Stream gives longest tool life. Finest finishes. Highest speeds and feeds. Best dimensional control. Cold Stream gives you all the performance you pay for. **JOHNSON'S WAX**

cold stream

For information, see your local Johnson industrial distributor.

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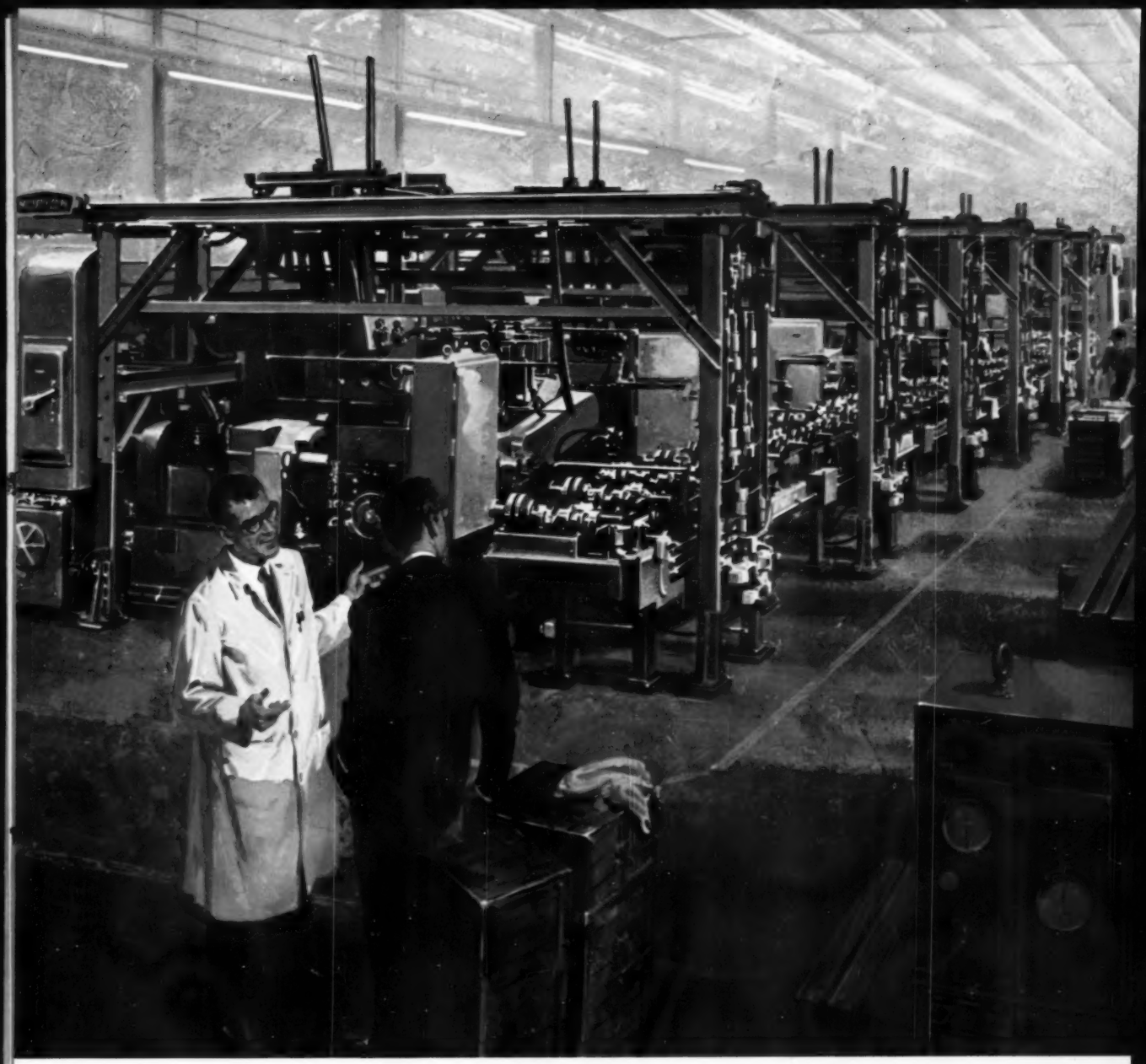

And now . . .
Norton Automatic Transfer Machines Multiply the "Touch of Gold"

The new Norton Transfer Type Crankshaft Grinder is actually many cylindrical grinders in one . . . in which adjusting, controlling, gaging, transferring and all other manual operations have become fully automatic! Once again the Norton "Touch of Gold" aids in mass-producing . . . swiftly, accurately, economically.

To the development of grinding machines — ranging from the smallest and simplest to the largest and most complicated — Norton brings the longest and broadest experience. See your Norton Man about putting this experience to work for you.

NORTON COMPANY, Machine Tool Division, Worcester 6, Mass.

NORTON
MACHINE TOOLS

75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes
MACHINE TOOL DIVISION: Grinding and Lapping Machines — **G & E DIVISION:** Shapers • Gear Cutting Machines • Gear Induction Hardeners

ARMSTRONG

TOOL HOLDERS

A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs.
Write for literature.

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If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

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ega

(A.I.S.I. Type A-6) is a tough, free-machining, air-hardening tool and die steel offering deeper hardening, less sensitivity to overheating and greater freedom from size change and distortion than other air-hardening grades such as A-4.

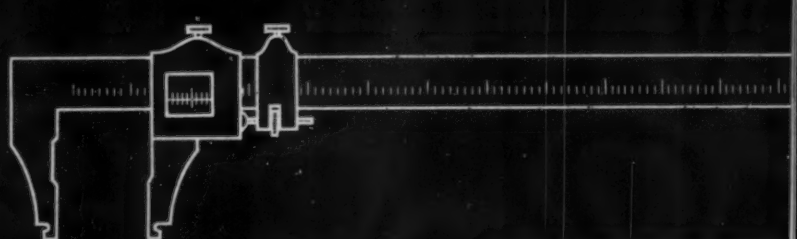
It can be hardened at temperatures as low as 1525°F.

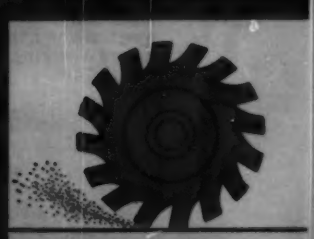
No other air-hardening tool and die steel is as easy to machine.

Produced by Carpenter's exclusive MEL-TROL® process, Vega-FM is beyond compare in uniformity and predictable performance.

Order now from your local Carpenter SERVICE CENTER.

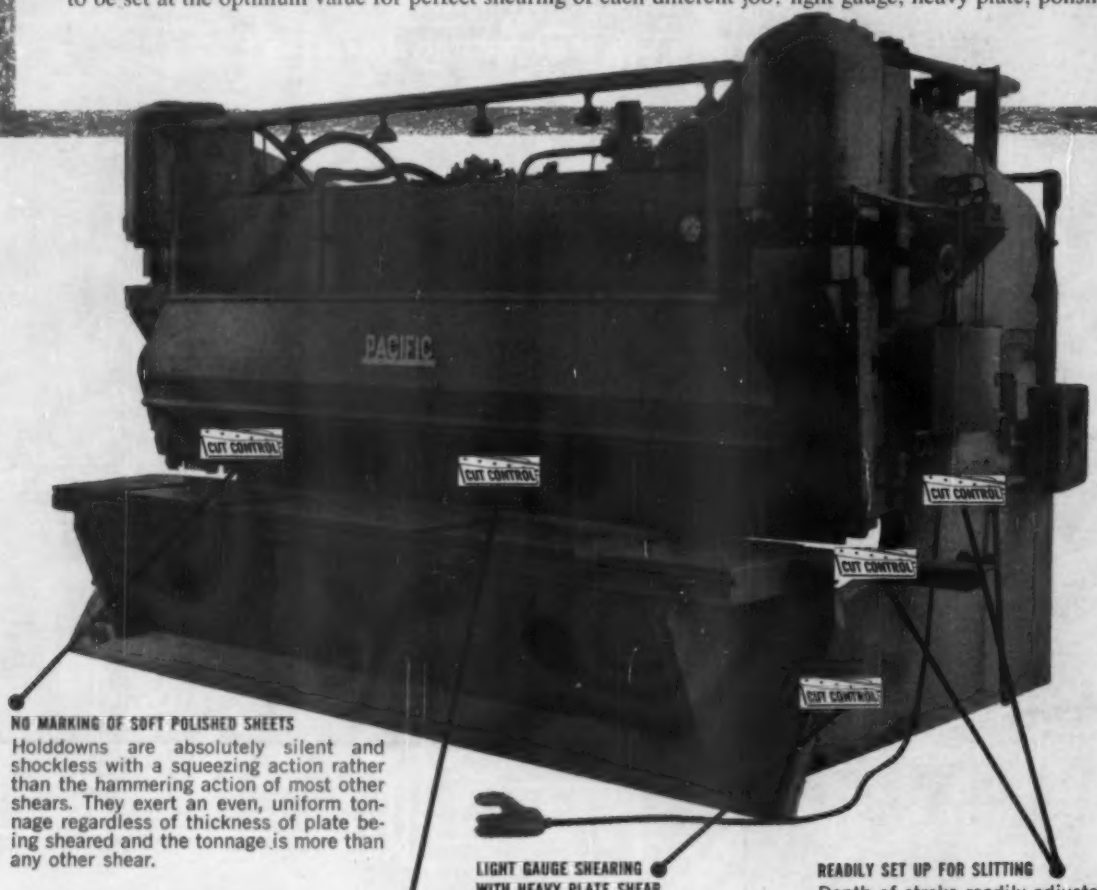
the *Carpenter* Steel Company, Reading, Pa.





CUT CONTROL adjustments to do jobs that

Unlike conventional shears that are limited in their shearing ability because they are permanently set without possible adjustment, PACIFIC features *Cut Control*—a group of adjustments which permit all controls to be set at the optimum value for perfect shearing of each different job: light gauge, heavy plate, polished



NO MARKING OF SOFT POLISHED SHEETS

Holddowns are absolutely silent and shockless with a squeezing action rather than the hammering action of most other shears. They exert an even, uniform tonnage regardless of thickness of plate being sheared and the tonnage is more than any other shear.

"INSURED" POSITIONING OF PLATES

For precision shearing, holddowns advance and positively grip plate independently of upper knife movement allowing operator to check for exact alignment (with aid of cut illumination) before shearing. All cuts are good cuts with PACIFIC.

LIGHT GAUGE SHEARING WITH HEAVY PLATE SHEAR

Knife clearance can quickly be adjusted over twice the range of any other shear so that PACIFIC can quickly be changed to cut either light gauge or heavy plate.

READILY SET UP FOR SLITTING

Depth of stroke readily adjusted so knives do not completely cross in slitting. This permits plates to be lined up with slitting attachment. Deep throats permit wide strips to be slit.

"CUSHIONED" SHEARING OF BRITTLE ALLOYS—Hydraulic power exerts smooth uniform shearing force cushioned against initial cutting shock and break-through shock. Rake angle readily adjusted for optimum setting to minimize or eliminate shock • HEAVIEST DUTY SHEAR—PACIFIC is designed for heavy duty continuous mill type service. It has more holddown tonnage, more horsepower and more weight in the actual stress bearing frame than any other shear. Customers report cutting full capacity stainless steel regularly • SAFEST SHEAR—Hydraulic system completely protected against deliberate or accidental overload. Shearing action can be stopped instantly in emergency by operator releasing foot pedal • LONGEST KNIFE LIFE—Customers report from 3 to 8 times longer knife life than mechanical shears. Knives cushioned against

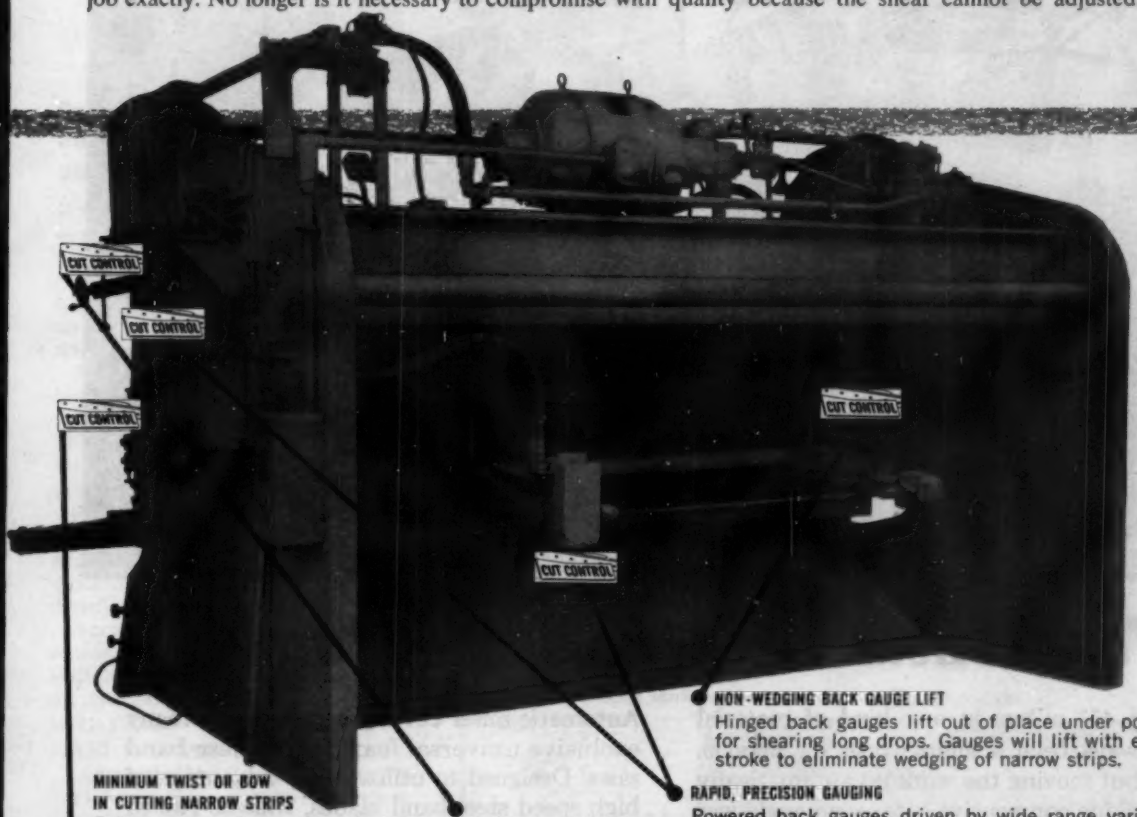
Write for brochure

PACIFIC INDUSTRIAL MANUFACTURING COMPANY

848 49th AVE., OAKLAND, CALIF. • PLANTS: OAKLAND, CALIF. and MT. CARMEL, ILL.

enable PACIFIC Hydraulic Shear are impossible on any other shear

stainless, soft aluminum, brittle alloys, long narrow strips, high speed cycling for high production, extreme accuracy for precision work, perfect mark-free edges. For the first time a shear can be controlled to fit the job exactly. No longer is it necessary to compromise with quality because the shear cannot be adjusted.



MINIMUM TWIST OR BOW IN CUTTING NARROW STRIPS

Rake angle can be readily adjusted to minimize or eliminate twist and bow in light materials. Even full capacity plate can be sheared at less rake angle than on other shears.

NON-WEDGING BACK GAUGE LIFT

Hinged back gauges lift out of place under power for shearing long drops. Gauges will lift with each stroke to eliminate wedging of narrow strips.

RAPID, PRECISION GAUGING

Powered back gauges driven by wide range variable speed hydraulic motor for rapid positioning with smooth deceleration to precise inching speed. Anti-friction ball screws; heavy single gauging bar; powered gauges controlled and indicated from front of shear.

HIGH CYCLING SPEED FOR HIGH PRODUCTION

PACIFIC has been designed to cycle as fast as an operator can feed it. Lineal speed of the ram has been selected at the optimum speed for maximum knife life and safety. Cycling speed is attained by shortening the stroke to the minimum permissible for each job thereby eliminating all wasted motion. In light gauge shearing of full length pieces, rake angle may also be reduced to further shorten the required stroke. In shearing small pieces or sheets that are less than the full length of the shear, the stroke can be shortened to the length of the sheet so that the upper knife returns upward immediately after completing the cut. Light strips can be sheared at rates up to 70 strokes per minute.

shock, protected against overload, uniform shearing speed through cut • NOISELESS OPERATION, QUIETER THAN A SEWING MACHINE—By completely eliminating usual loud, shattering noise through cushioned shockless shearing, PACIFIC has promoted measurable increase in efficiency of plant and office workers. No interference with adjacent electronic burning and gauging equipment • LOWEST MAINTENANCE—No wearing parts such as clutches, gears, bearings, brakes. All moving parts run in filtered oil. Only maintenance items are a few standard solenoids, relays, microswitches and yearly oil changes • HUNDREDS OF DOLLARS OF SAVINGS IN FOUNDATION COST—Foundation required to resist only dead weight and insure proper line-up. It need not resist heavy shocks, hammering and twisting of mechanical shear.

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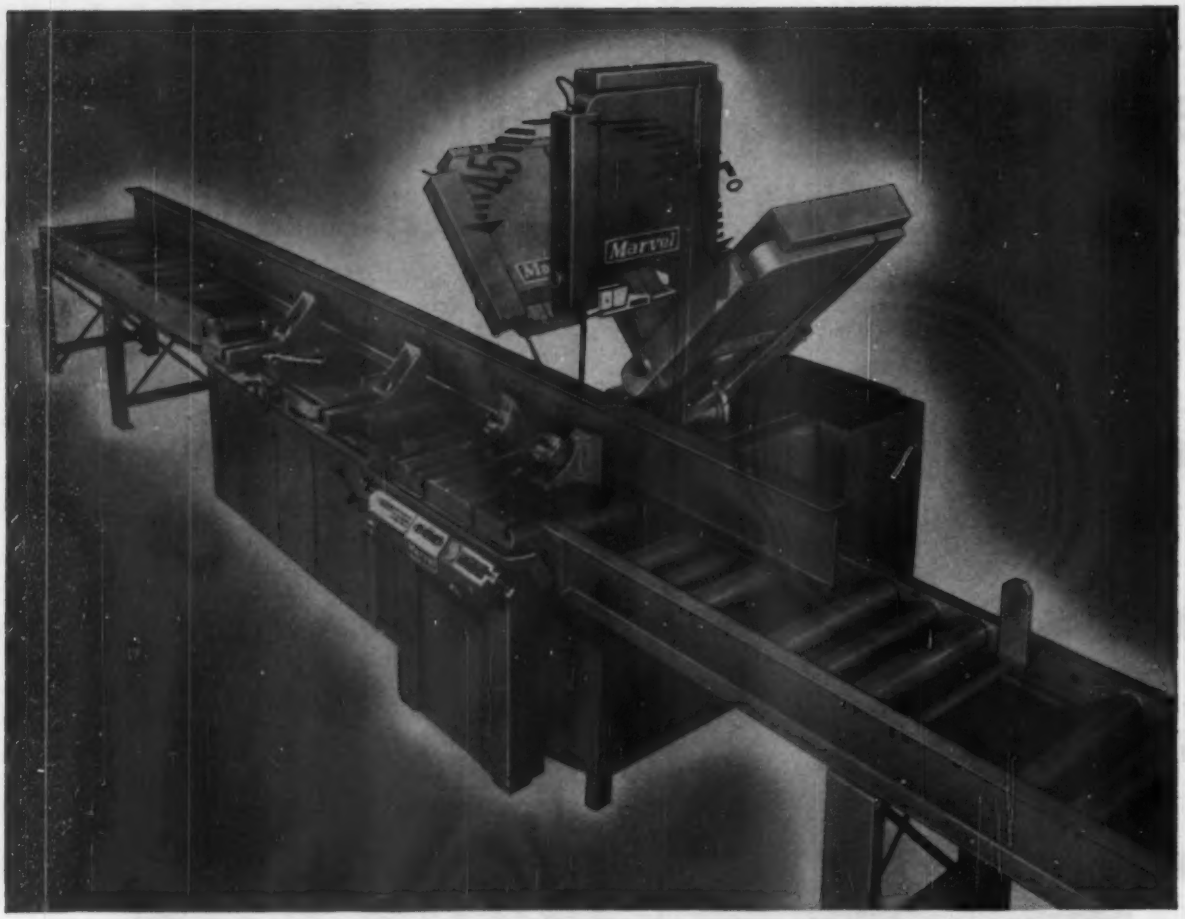


Tips Its Head To Cut Production Corners

Sawing 45° miters in any kind of material has always been a simple task for MARVEL Saws, but moving the work up automatically and making consecutive cuts on an angle was a problem, especially when the work was long and cumbersome.

This triple exposure photograph of a new MARVEL No. 81A All Hydraulic Heavy Duty Automatic Bar Feed Band Saw, illustrates how the upright head or column can be tipped 45° either right or left of vertical to make angle or miter cuts. The work is held stationary while the column, which carries the blade, is fed forward, meeting the work squarely to insure accurate cutting. After the cut is completed, the work is automatically moved up and measured, and another cut made.

Automatic miter cutting is just one of many exclusive universal features of these band saws. Designed to utilize every advantage of high speed steel band blades, MARVEL No. 81 Series Band Saws can handle almost any conceivable sawing job—from the smallest, most delicate work, up to 18" x 20" shapes.

Only the MARVEL No. 81 Band Saws have the "SURE-LINE" Automatic Accuracy Control (basic patent applied for) which literally steers a blade to make a straight cut. This unit extends usable blade life as much as 50%.

MARVEL No. 81 Series Band Saws are proving themselves daily, as the most versatile machine tools in production metalworking plants.

For complete details, or a demonstration of MARVEL Sawing Equipment, write: Armstrong-Blum Manufacturing Co., 5700 W. Bloomingdale Ave., Chicago 39, Ill.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

MMT PE

PRODUCTION POINTERS from GISHOLT

More cost-cutting IDEAS— to help you

HOW TO GET HIGH PRODUCTION EFFICIENCY ON SMALL LOTS

Fairfield Mfg. Co. saves 30% on wide variety of short-run gear blanks

If your work includes heavy stock removal on big parts, you will be interested in this setup. Here one man with two Gisholt MASTERLINE No. 24 Automatic Chucking Lathes cuts time an average of 30% on work formerly done on three older machines!

Work includes a large variety of bevel and spur ring blanks for heavy-duty automotive gears from 18″ to 33″ O.D. These tough steel forgings are produced in lots of 20 to 200 pieces on a 3-shift basis five days a week. The machine selected had to combine ruggedness and dependability with a fast, automatic cycle and quick changeover—all vital to profits. This is where the No. 24 shines.

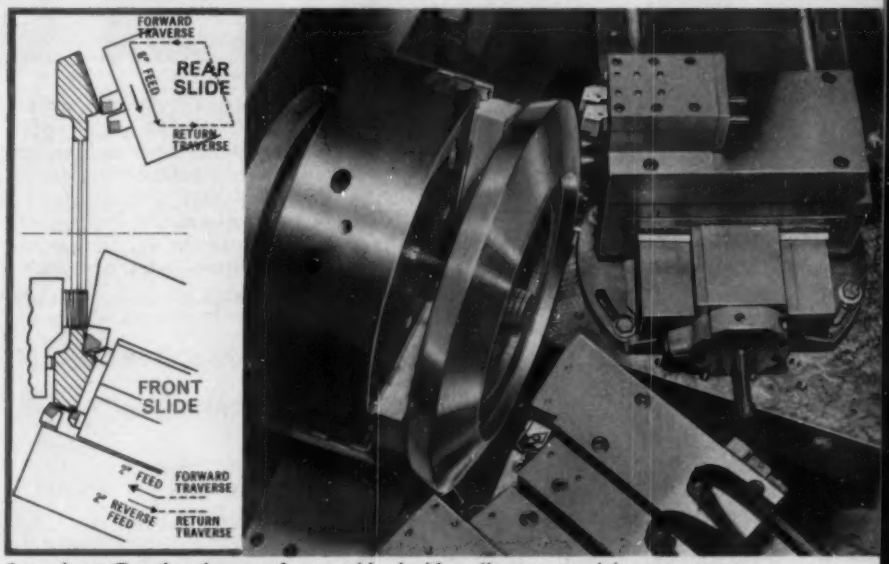
According to the user, Fairfield Manufacturing Company, Lafayette, Indiana, a 68% saving was obtained on the 24½″ O.D. bevel ring gear setup shown:

FIRST OPERATION—10.5 minutes f.t.f. on the No. 24 as compared to 31.5 minutes on the older machines.

SECOND OPERATION—11.75 minutes compared to 38 minutes.

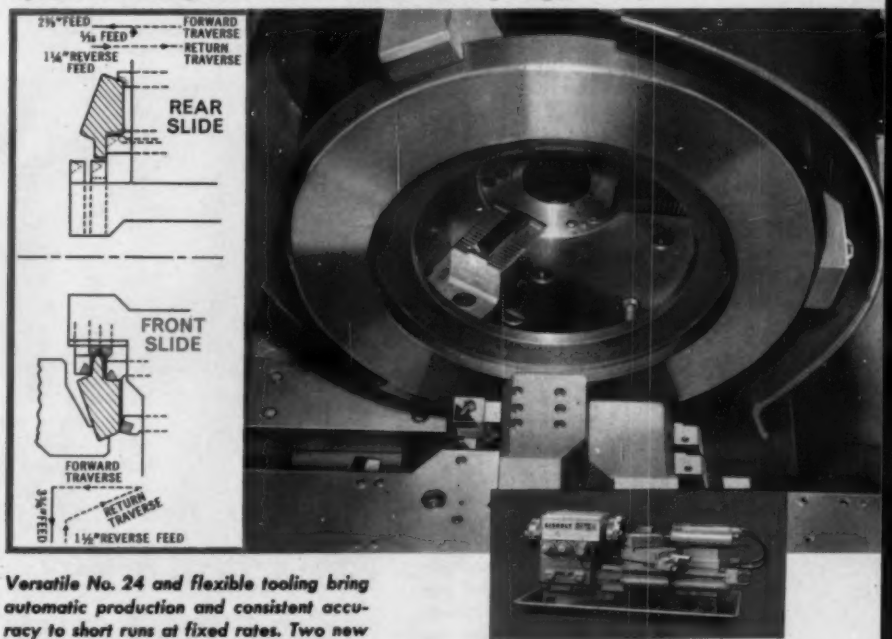
The drawings show how the various surfaces are handled by the tooling on the front and rear independent slides.

Change-over is fast—approximately 2½ hours from size to size on similar parts and five hours maximum type to type. The front carriage has an adjustable base and the front and rear independent slides are mounted on 90° angularly graduated swivel bases. Each independent slide has two forward feed rates and one reverse feed—all available during the automatic cycle. Reverse feed simplifies the holding of close tolerances and provides required fine surface finish.



Operation 1: Drawing shows surfaces machined with tooling setup at right.

Operation 2: Drawing shows surfaces machined with setup at right.



Versatile No. 24 and flexible tooling bring automatic production and consistent accuracy to short runs at fixed rates. Two new machines handled by one operator permit use of carbides to cut time an average of 30% and replace three older machines.

For complete information on the Gisholt No. 24 Automatic Lathe, circle No. 715 on Reader Service Card.

MMT-PE

HOW GLOBE OIL TOOL GROOVES ROTARY ROCK BIT CUTTERS 500% FASTER

One basic tooling setup handles two operations on wide variety of similar parts

One of the toughest jobs in manufacturing rotary rock bit cutters is the machining of deep grooves in the tough steel forgings. The machine must be rigid and powerful for maximum metal removal and long tool life. It must also be versatile to economically handle a variety of sizes, in small lots.

To meet all these requirements, Globe Oil Tool Co., Los Nietos, California, selected a Gisholt Simplimatic Automatic Lathe. Not only did the Simplimatic replace three older lathes, it reduced machining time 80%.

Each cutter requires two operations. Tooling is carefully planned so that one basic setup will handle both operations on all sizes from 5⅞″ to 18″. Lots range from 25 to 1000 pieces.

The first operation consists of rough- and finish-turning the cone O.D. with tools on the front and rear independent slides. The second operation, grooving, is divided between the front and rear independent slides. The slides operate simultaneously during both operations. F.t.f. times, for the 6⅛″ cone shown: first operation, 1.2 minutes; second operation, 2.5 minutes.

Second operation setup for grooving the 6⅛″ steel rotary rock bit cutter shown at far right, inset. Other parts, from left to right: rough forging; after first operation; three different cutter types produced from the one size forging.

One basic setup handles all sizes and types. Swivel-base tool slides are quickly set for correct cone angles. Open-face tool blocks permit addition or removal of tools.

For complete information on the Simplimatic, circle No. 716 on Readvr Service Cards.

FOUR-STEP BALANCING OPERATION COMPLETED IN ONE HANDLING

Work is driven from below to eliminate belt-lifting for faster production

Every balancing operation consists of four basic steps: location of angle; measurement of amount; unbalance correction; inspection. This 1S Balancer setup, in the plant of a well-known automotive manufacturer, demonstrates how all four steps can be completed in one handling.

The workpiece is a 9-lb. alternator rotor assembly. It rests on top of the driving belt, eliminating the need to raise the belt to load and unload.

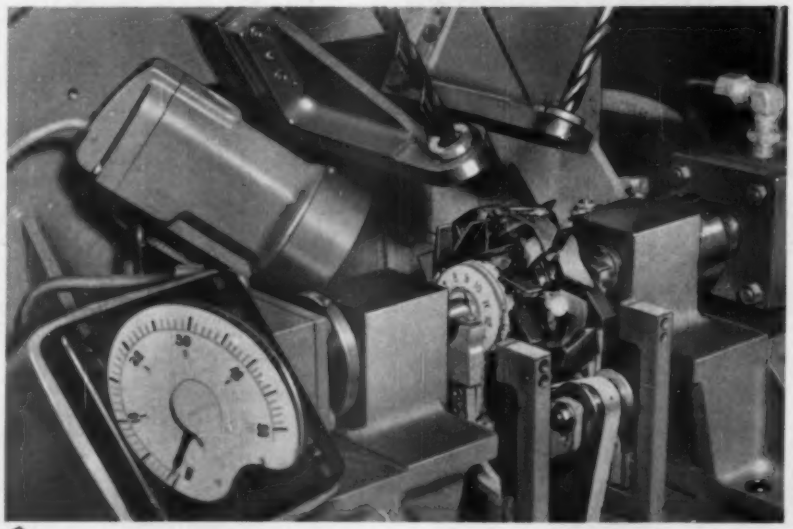
Because Gisholt Balancers indicate the angle and amount of unbalance electrically in each correction plane, there is no guesswork by the operator. The strobe lamp shows the exact angle of unbalance on a numbered disc. The amount meter is calibrated in units of depth of a ½″ drill starting at a 2¼″ radius.

An air clamp arrangement lifts the work out of the supporting fixture and holds for correction drilling. Two drill spindles drill at the indicated angles to the depths shown on the amount meter, correcting for balance in each plane.

Driving work from below eliminates belt-handling, ups production to 44 parts per hour at 80% efficiency. This includes locating, measuring, correcting and inspecting for balance in each plane.

Operator about to make drill correction in right correction plane. He matches meter reading with depth dial on drill head, eliminating guesswork. Special work-holding and thrust device prevents damage to supporting fixture.

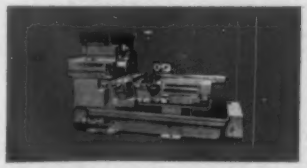
For complete information on Gisholt Balancers, circle No. 717 on Reader Service Card.



Strobe lamp, focused on numbered disc on left hub of part, clearly shows exact angle of unbalance in each plane. Note direct-reading amount meter, electrically calibrated in units of drill depth to minimize operator effort.

HOW CRANE LTD. TURNS OUT NEW VALVE LINE AT PEAK EFFICIENCY

Crane Ltd., Montreal, Quebec, Canada, in setting up to produce a new valve line, investigated the many claims being made for latest automatic machining methods. Crane's work included intricate contours on both bar and chucking jobs in a wide variety of sizes. The two setups shown here are giving Crane the cost-cutting efficiency it hoped to find.



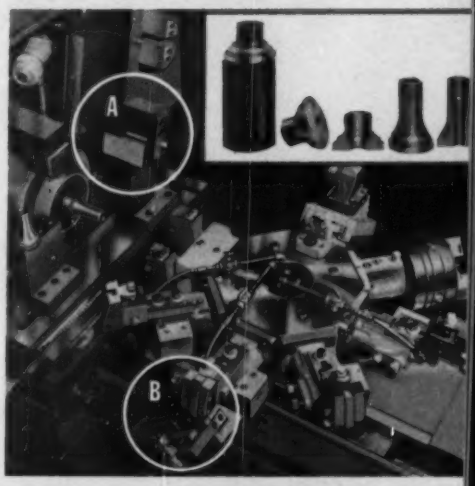
Gisholt No. 5 Automatic Ram converts quickly to bar or chucking work

The tooling setup shown at right, on a MASTERLINE No. 5 Automatic Ram, is typical.

A special octagonal turret and front and rear tools on the cross slide provide ample tooling stations to complete most parts in a single operation. Spindle speeds and machine functions such as bar feed, collet operation, turret index, traverse, feed selection, turret return and cross-slide operation are preset. Reduced pressure for threading, and a die-head cocking device are also preset.

Setup is as fast as for a hand-operated ram type turret lathe. Only minor tool adjustments and tool changes are needed for the entire work range.

On bar work, the lathe requires attention only when stock is exhausted or when chips must be cleared. On chucking work, the operator loads, starts the cycle and unloads. In addition to fast machining, optimum tool life and consistent quality at fixed production rates, the automatic cycle allows the operator to do other work.



Inset shows typical bar jobs. Each is produced in one automatic operation.

Tooling setup for part at right, an inside screw union bonnet for a 1½" cast steel, 600 p.s.i. gate valve, produced from 3", cold rolled C-1026 bar stock.

A retracting locator (A) acts as a stock stop. Turret tools turn the O.D.; drill, bore, form, face, chamfer and thread the O.D. A plunger (B) recocks the die head during indexing. O.D. radius is formed from rear of cross slide. Finished part is cut off from front of cross slide, and cycle repeats. Time, 4.2 minutes f.t.f.

Get the facts on the Gisholt AR (Automatic Ram) Turret Lathe. Circle No. 718 on Reader Service Card.

Fastermatic with JETracer handles I.D. contours automatically

Intricate contours on opposing inside diameters of over ten different parts are handled automatically on a Gisholt MASTERLINE 2F Fastermatic. These include five sizes of 600-lb. cast steel gate valve bodies ranging from ½" up to 2".

In selecting a machine for this work, Crane Ltd. wanted the versatility of tooling usually found only in a manual turret lathe, and automatic cycle production. Also, the machine had to handle a wide range of parts in long and short runs with minimum tooling and quick change-over. All these requirements were met by a 2F Fastermatic equipped with a turret-mounted JETracer slide tool and an indexing work-holding fixture.

Here are other features that provide the versatility to handle the wide range of work economically:

Octagon Turret—provides maximum tooling stations permitting complex work to be completed in one chucking on most parts;

Automatic Spindle Positioner—to reduce loading-unloading time;

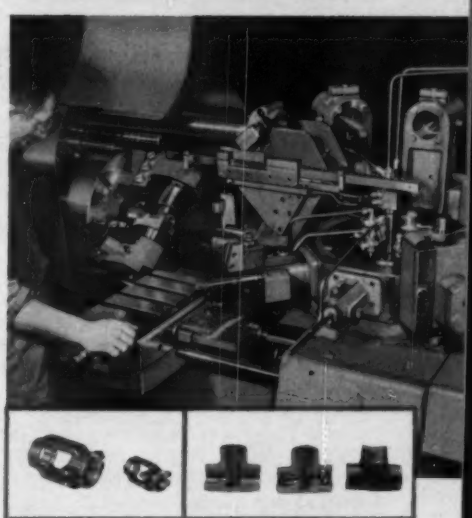
Automatic Forward-Reverse of Spindle—for all types of threading work using die-heads or taps;

Turret Threading Attachment—to produce high-quality, close-tolerance threads;

Two-Speed Motor—to assure proper surface speeds for turning, boring, threading, forming, etc.;

Turret Facing Attachment—to actuate turret-mounted recessing tools.

The most unusual feature of this setup is the use of a turret-mounted JETracer slide tool, operated automatically during the machining cycle. The flat template is held in a sliding bracket that obtains length location by engaging a stop bar on the side of the overhead pilot bar. Continued forward feed of the turret saddle causes the tracer stylus to follow the template contour, governing movement of the single-point tool on the tracer slide.



Inset shows two typical parts. Each is machined at both ends in one chucking. The ½", 600 lb. cast steel gate valve body at the right of the inset is handled with the setup shown. First, one end is machined, requiring one complete index of the octagon turret. The work is indexed 180° and another complete index of the turret finishes the other end. Total time, only 3.20 minutes f.t.f.

Tracing provides highest accuracy and eliminates chance of error on contours, etc. Since all diameters are finished with one tool, only one dimension needs to be checked greatly simplifying inspection. Again, the automatic cycle frees the operator for other work.

For complete information on the Fastermatic, circle No. 719 on Reader Service Card.

GISHOLT

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW MACHINE GUARANTEE

Operator inserts C-clamp on draw rod and holds brake drum against adapter to centralize and locate while actuating foot control to clamp the part. During the automatic cycle, .003″ to .005″ stock is removed and a "controlled" surface finish of 50 micro-inches RMS is produced. Time, 15 seconds f.t.f. Inset left, bored part; right, part after Superfinishing operation that eliminated intermediate grinding.

SUPERFINISH ELIMINATES GRINDING AND IMPROVES BRAKE DRUM QUALITY

Superfinish provides greater area contact, removes smear metal for longer life

Superfinish saves in many ways: Equipment cost is low. "Controlled" finishes are obtained in seconds. Part geometry is improved. A better surface is produced, with "peaks" removed, leaving plateaus and valleys for greater area contact. Surface smear metal is "scrubbed" away, exposing true base metal for longer service life. Superfinishing can also be used for stock removal as well as for fine finish. In many cases, parts are turned or faced and then Superfinished—eliminating intermediate operations.

All these points are demonstrated by this setup on a Gisholt Brake Drum Superfinisher. The workpiece is a cast iron drum with an 11″ diameter 2 3/16″-deep braking surface. It comes to the machine bored within limits of plus .005″, minus .000″, and has a surface finish of approximately 250 micro-inches RMS.

It is loaded with the open end towards the headstock. An adapter locates and centralizes against the inside of the mounting flange. A C-clamp is slipped on a draw rod extending through the small bore to hold from the other side. When the automatic cycle starts, two sets of Superfinishing stones expand, contacting the I.D. One set of stones roughs, removing from .003″ to .005″ of stock. The other set finishes, producing a "controlled" 50 micro-inch RMS surface. Time, only 15 seconds f.t.f.

Superfinish can save and improve quality for you, too. Gisholt has a complete line of general-purpose, high-production or special Superfinishers to meet your every need.

For complete information on Superfinishing, circle No. 720 on Reader Service Card.

ACME INDUSTRIAL THREADS STAINLESS 467% FASTER, ELIMINATES REJECTS WITH CRI-DAN

Threading an I.D. taper up to a shoulder eliminates heat-treat distortion problem

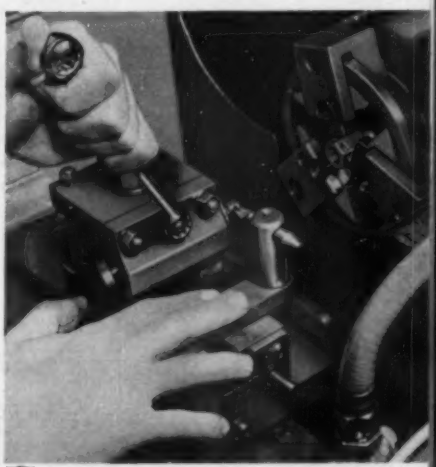
Producing a 20 TPI NF Class 3 thread right up to the shoulder in the bore on the hex end of this 440C stainless spool valve presented a host of problems—problems that could be handled economically only on the Gisholt CRI-DAN B.

Acme Industrial Co., Chicago, Illinois, was producing this part in lots of 4000 pieces, using taps. First a standard tap...then a bottom tap at 15 pieces per hour for each operation. Breakage was excessive. After tapping, the part was hardened and the threaded end was annealed. Shrinkage at the base of the bore resulted in a tapered thread. This required another bottom tapping and often resulted in more broken taps. Rejects ran as high as 20%.

A CRI-DAN B Threading Lathe solved the problem by producing a tapered thread with the large diameter at the shoulder at the back of the bore. Shrinkage after hardening and annealing produces the desired straight thread. The thread is completed in 22 automatic passes with diminishing in-feed, for fine finish and easy holding of the .4675″ go, .4701″ no-go tolerance. Production, 35 pieces per hour. A single-point carbide threading tool is used, which produces about 75 parts per grind.

5.03 minutes saved per part...tap breakage and rejects eliminated. Straight, tapered, multiple-start, left- or right-hand threads are standard with CRI-DAN. Here a single-point carbide tool is used to thread faster, more accurately, and at less cost than any other method.

For complete information on CRI-DAN Threading Lathes, circle No. 721 on Reader Service Card.



Operator uses gage for quick "on-center" positioning of threading tool. Part is centered and located for length in bushing in bore of special chuck having three slotted jaws. The slots retain a loose ring. Pressure distorts the ring, causing three swivel jaws to centralize, grip and drive on the hex O.D.

Rough and threaded part.

No. 5-660
760

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Printed in U.S.A.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • Packaging Machines • Masterglas Molded Plastic Products

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Just a thumb-push...and steel teeth fasten steel with Tinnerman "U" CLIPS

Twin-action gives this Tinnerman "U" SPEED CLIP® extra holding power in fastening together two sheets of metal, plastic or wood without screws... the heat-treated spring steel tension in the "U" exerts a clamping action... the tiny upset barbs bite in and hold on for keeps.

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FROM CREATIVE CRUCIBLE: HIGH SPEED STEELS THAT MAKE BETTER TOOLS POSSIBLE

CHECKING THE INVOLUTE PROFILE OF A SPLINE BROACH. Broach's 6" pitch diameter is designed to cut 48 splines—hold accuracy of +.0002"-.000" on all splines for 30". This accuracy is possible on broaches up to 82" when made of Rex High Speed Steel.

CIRCLE 193 READER SERVICE CARD

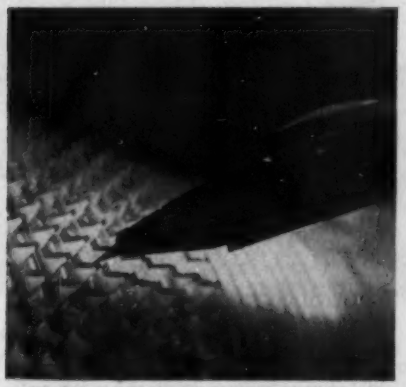
NOW, BROACHES PRODUCE MORE PIECES FASTER

They're also producing pieces with finer finishes and greater accuracy – because they're made of continually-improved Rex® High Speed Steels.

New broach designs and new broaching machines now enable you to mass-produce complex shapes in a matter of minutes. Furthermore, every piece is finely finished to within micro-inch tolerances.

What is behind this development? It's the increased skill of the broach tool makers, combined with Crucible's progress in making better high speed steels.

To produce the fine steels needed for broaches, Crucible tool steel specialists make use of the most advanced electronic instrumentation available today. For example: they use precision instruments to control the temperature of the molten metal in the melting furnace. So, each heat is produced under identical conditions.



CHECKING THE TOOTH SPACING OF HELICAL INVOLUTE SPLINE. Finishing teeth on broaches made of Rex High Speed Steels reproduce shapes within tolerances of a few ten-thousandths of an inch.

Crucible tool steel specialists employ new techniques that greatly improve deoxidation of the liquid steel. They also use new ingot mold designs that provide freedom from segregation when the steel solidifies. And they ultrasonically inspect every billet of Rex High Speed Steel before rolling or forging.

Today Rex High Speed Steels continue to make the best broaches because they offer *1.* more uniform distribution of carbides throughout the section. This ensures minimum size change, greater predictability in heat treatment, greater hardenability and more uniform hardness in the heat-treated tool. And *2.* more uniform distribution of sulfides in the free-machining grades—which provides improved machinability and superior surface finish.

To make precision tools better with Crucible's Rex High Speed Steels, call or write the nearest Crucible branch office or warehouse.

BETTER TOOLS, THROUGH BETTER STEELS. The constant improvement of Rex High Speed Steels ensures the increasingly better performance of hobs, taps, twist drills and cutters—as well as broaches.

CRUCIBLE STEEL COMPANY OF AMERICA

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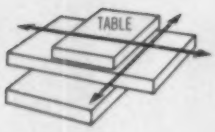
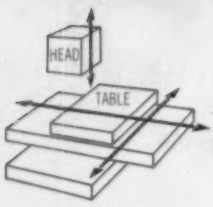


1 This two-axis Sundstrand Jigmatic positioning table placed under existing machines, such as radial drills, eliminates jigs and fixtures, provides positioning accuracies to ±.001", greatly increases productivity. Table working surface is 20" x 30".



2 A moderately priced machine with two-axis positioning of work is provided by mounting one or more vertical heads on a simple frame above a Sundstrand numerically controlled Jigmatic table.

"Engineered Production" concept applied to numerical control

. . . a system of machines to best meet the economic requirements of your production

There is no more reason to adapt your production to a particular type of numerically controlled machine than there is to adapt it to conventionally controlled machines. New Sundstrand machines with numerical point control have been developed to meet the Sundstrand "Engineered Production" concept — which evaluates your job requirements from the standpoint of methods and economics and then provides the machine that best fits these requirements.

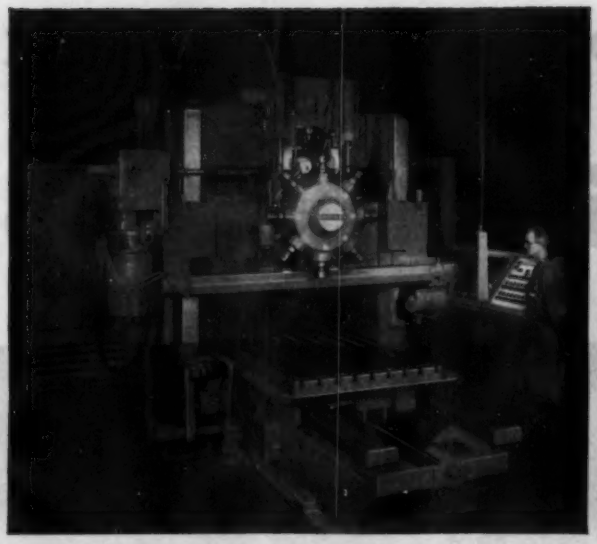
Some of the machines illustrated are completely new types. Others are familiar Sundstrand machines with necessary design modifications to take the fullest advantage of numerical control. Any one of them is ready to fit right into your production line — to replace one or more machines now performing the same operation, or to combine several operations now performed on different machines.

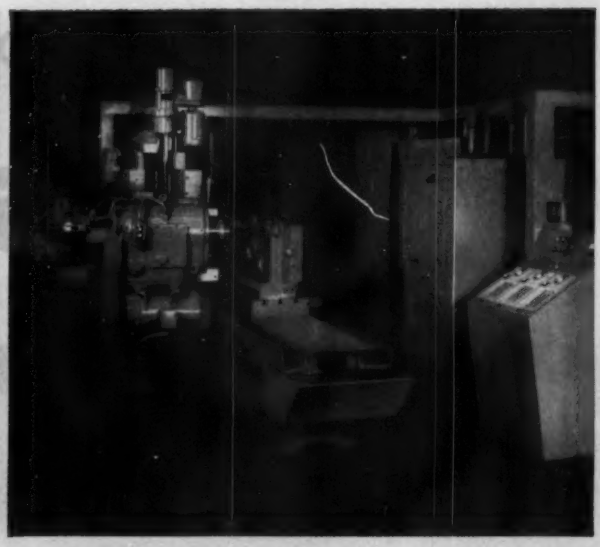
Other new Sundstrand numerically controlled machines now being built will extend the system to encompass a far greater range of requirements. Watch for their announcement — and be sure to see Sundstrand numerically controlled equipment at the Machine Tool Exposition, space No. 1014.

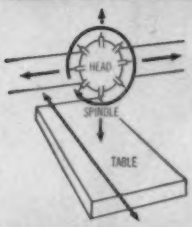
SUNDSTRAND

SUNDSTRAND MACHINE TOOL

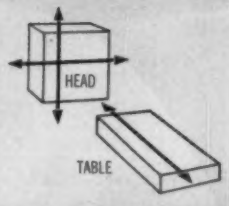
BELVIDERE, ILLINOIS • DIVISION OF SUNDSTRAND CORPORATION



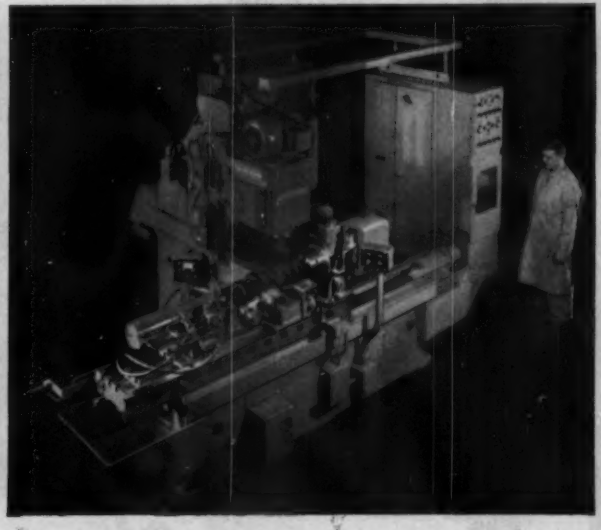


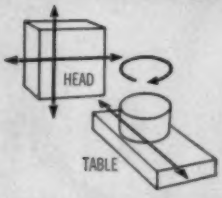


3 This new turret-type machine with a 40" x 60" table, provides the necessary range for precision machining of workpieces too large for the standard Jigmatic table. The head travels on a crossrail which is adequately supported at each end by a vertical column. All motions, including turret rotation, are numerically controlled.

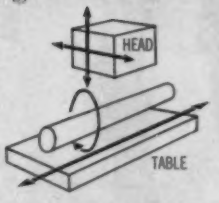


4 This three-axis machine with quick tool change handles a wide range of boring, drilling, reaming, tapping, milling, and related operations. The basic machine is built up of proven Sundstrand Rigidmil components, modified for numerical control. Table size and table and column travel can be furnished to suit job requirements.

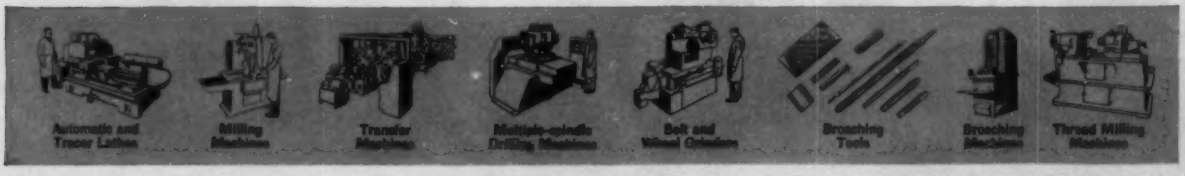




5 This three-axis machine is equipped with a numerically controlled index fixture which presents all four sides of the workpiece to the cutting tools. Otherwise, it is identical to the machine described in paragraph 4 above.



6 This machine typifies the Sundstrand "Engineered Production" approach to machining. Designed to mill locating spots on six different crankshafts, the basic components are standard. The spindle and workpiece are numerically positioned.



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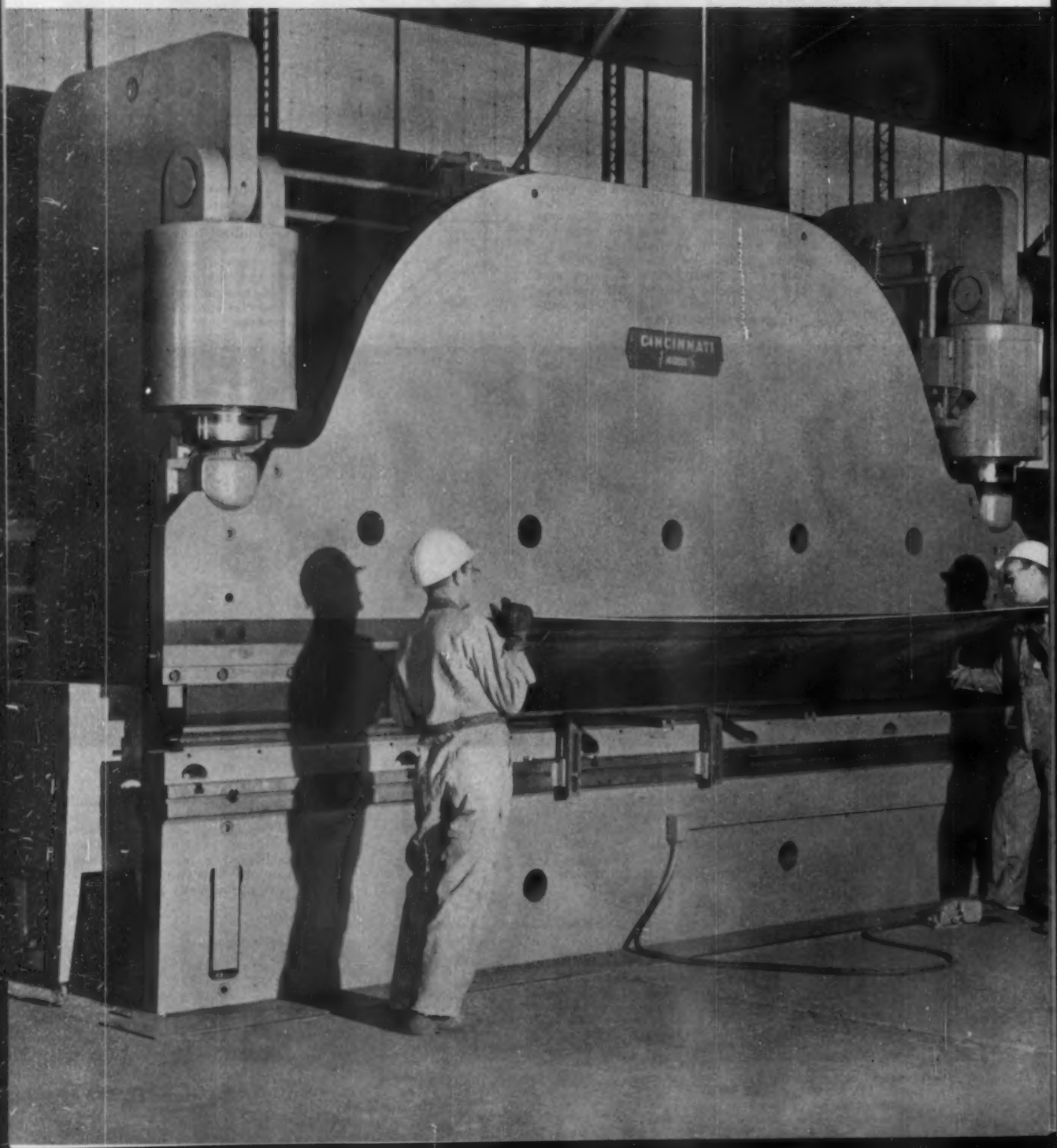
CINCINNATI® HYDRAULIC PRESS BRAKE

shortens



set-up time

Fabricators who bend many different shapes during a day, but only a few pieces of each shape, will increase their earnings with a Cincinnati Hydraulic Press Brake. This installation at the Bannock Steel Company, Pocatello, Idaho, demonstrates the point.

Those varied shapes at the end of the machine were all bent during a single shift. Says Bannock's S. L. Cate: "We have found the flexibility of our Cincinnati Hydraulic Press Brake ideal for this application."

Set-up time is reduced by quick adjustments of stroke depth and upper stop. Dies and machine are protected by Cincinnati Automatic Overload Protection and Adjustable Tonnage Control.

See your local representative for full information on Cincinnati Hydraulic or Mechanical Press Brakes. Check our insert in Sweet's Machine Tool file.

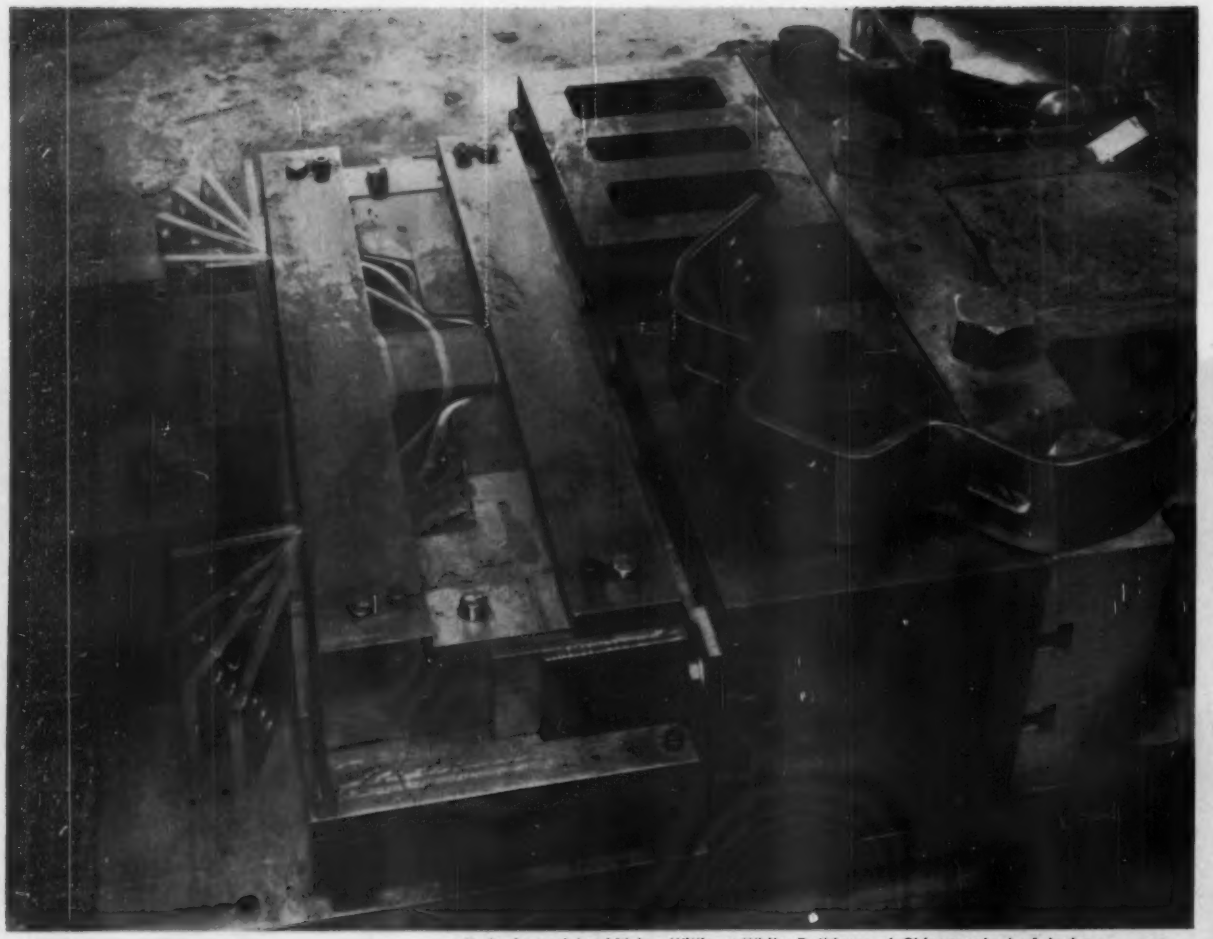
Courtesy the Bannock Steel Company

Shapers / Shears / Press Brakes

THE **CINCINNATI SHAPER** CO.

Cincinnati 11, Ohio, U.S.A.

In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow



Parts formed by 100-ton Williams-White Bulldozer at Chicago plant of Joslyn Manufacturing and Supply Company. Holes are drilled in previous operation.

150% production boost -- 2 steps eliminated with Williams-White hydraulic Bulldozer

The job: Form a hot rolled steel workpiece, ½" x 4" x 42", in one operation. Previously, this tough assignment took 3 strokes of a press. Production rate was 40 parts per hour. NOW — a 100-ton Williams-White Bulldozer with hydraulic cushion, utilizing special tooling by Joslyn engineers, forms the hot steel in one squeeze. Current production rate: 100 parts per hour. The production increase and elimination of 2 steps in this application are typical of results gained with Williams-White heavy machinery and skillful tooling. Check into the time and money-saving advantages of metal forming equipment built by Williams-White, originator of the bulldozer. Write for illustrated Bulletin #73.

107th year

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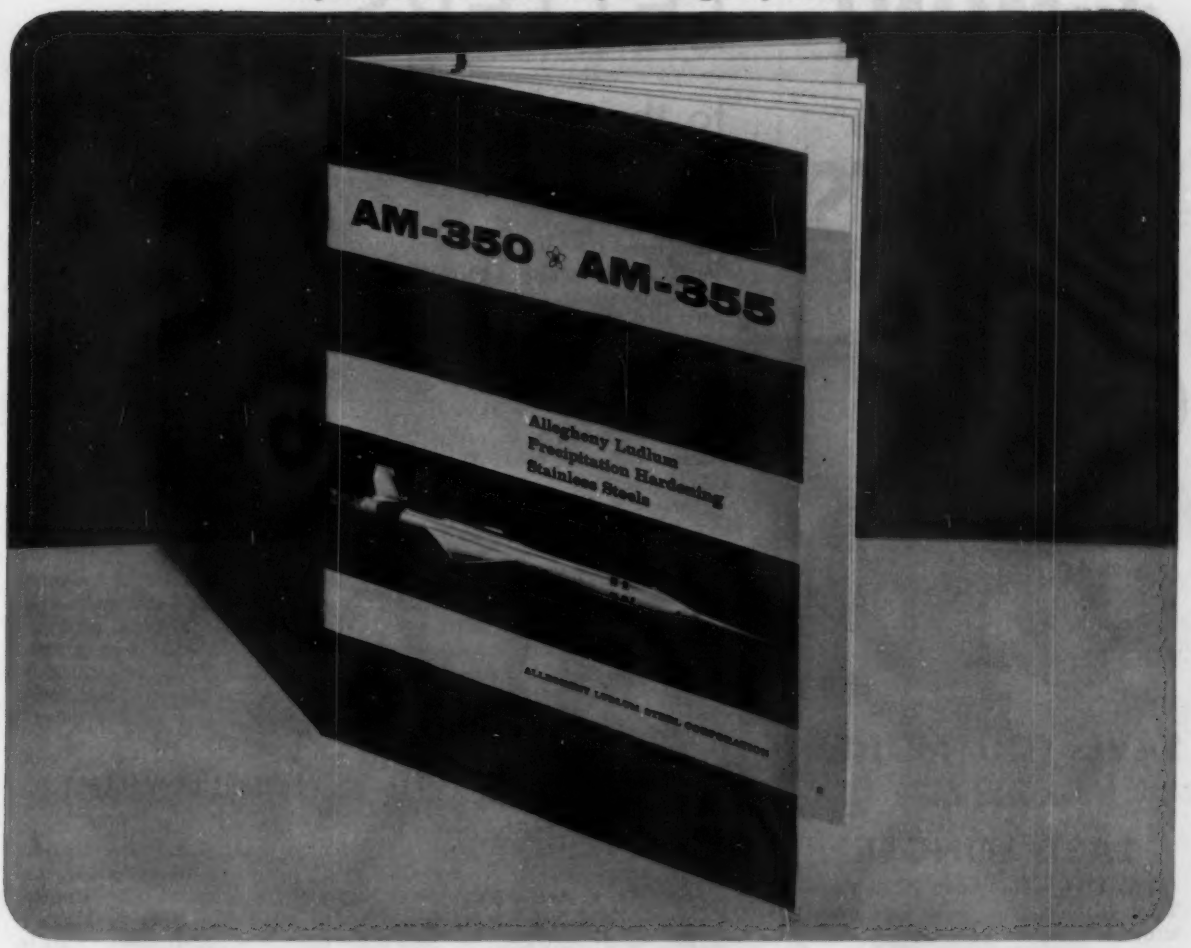

New booklet on A-L's precipitation-hardening stainless steels, AM-350 and AM-355

A tool for anyone interested in high strength-to-weight metals

In this technical booklet, you get the facts on Allegheny Ludlum's precipitation hardening stainless steels, AM-350 and AM-355, metals developed for space age requirements.

AM-350 and AM-355 combine these unusual qualities. They are easy to fabricate. Have high strength-to-weight ratios at room and elevated temperatures combined with excellent resistance to corrosion.

The physical and mechanical properties of the two metals are described in 33 charts and tables. Included are heat-treatment and fabrication data, eight photomicrographs and a section on corrosion resistance with representative values in selected environments.

It's jam-packed with data. For your free copy, see your A-L representative or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. Address Dept. AM 5-3.*

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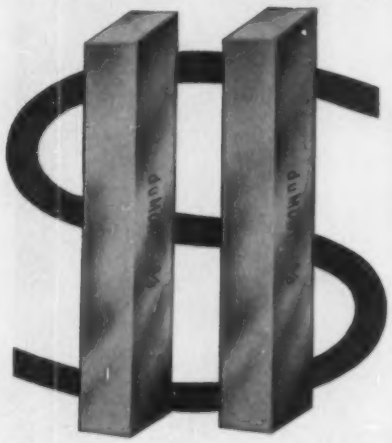

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Company.....

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LETTERS

to the editors

330 W 42nd St, New York 36, NY

Formulas by what.book?

Dear Sirs:
I have read the article "Time formulas by the book" (*AM/MM*—Mar 21 '60, p138), and was keenly interested in it.

But—I expected in each succeeding line to read where the *Standard Data Manual for a Machine Shop* could be obtained. It's the best sales pitch I've seen for a book. Where or how can a copy be obtained?

Mitchell Fein
Hillsdale, NJ

Dear Sirs:
. . . Please advise if latest edition of book has been published and where copies could be purchased.

Nikolai Belaef
Hamilton, Ohio

Dear Sirs:
I am greatly interested in obtaining the *Standard Data Manual* . . .

Karl Hangartner
Guelph, Ontario

As the article stated, the manual was developed by H B Maynard & Co for use in its consultant work. It has never appeared in book form. To clarify the issue, we furnish this statement from Maynard & Co:

"The standard data manual is not presently available for purchase. It was developed by our firm during the course of our consulting assignments. As a result, it is not sufficiently detailed to be used without some counsel and guidance.

"Rather than run the risk of having the data in this manual improperly applied, we have followed a policy of making it available only to clients who have been properly instructed in its use.

"As we gain additional experience in applying these data, and in instructing others in the proper application, it is possible that we will be able to detail the manual to the point where it may be used without any additional guidance or counsel. At the present time it appears that the publishing of this data, perhaps in book form, is at least a year or two away."

Apprentice Contest

Dear Sirs:
I note with considerable interest your article on the 1959 California Statewide Apprentice Contest (*AM/MM*—Feb 8 '60, p111).

Certainly, congratulations are in order for such excellent coverage of that event—to your staff for the editing and layout, and to Mike Murphy of your Los Angeles News

SHOPMATES

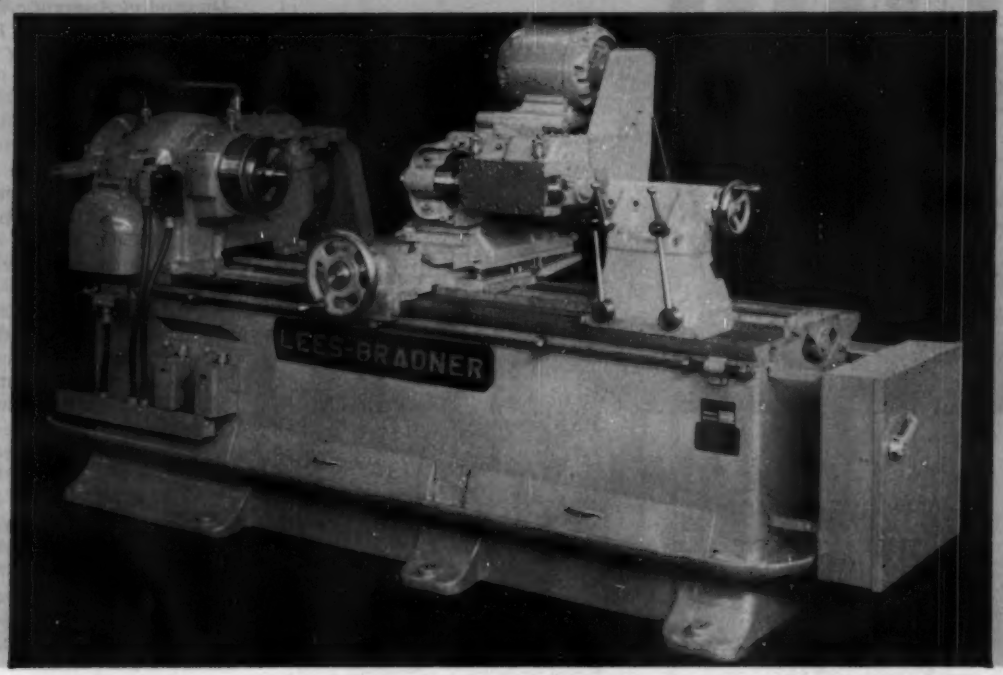
N. Jarvis

— I DUNNO WHY I HAND YOU GUYS ALL MY INVENTIONS.... SEE THIS ?? IT'S A NEW DESIGN FER A COTTER PIN... HERE'S HOW IT WORKS....
THE ONLY THING HE EVER INVENTED IS EXCUSES FER GOOFIN' OFF !!
THE ENGINEERS HAVE TO DO DOUBLE DUTY.... OUT SMART OUR COMPETITORS AND PROTECT US FROM GUYS LIKE HIM !!
AL JARVIS

This WORM...

will turn better...thanks to...

THE LEES-BRADNER HT



Building precision into other machine tools is the unique distinction that can be claimed for The Lees-Bradner Model HT Thread Milling Machine.

The worm illustrated above was produced on this machine by the Cleveland Worm and Gear Co. in one hour 23 minutes at a cutter spindle speed of 61 R. P. M. The pitch diameter of the worm was 3.728" with an outside diameter of 4.625".

Many tough thread milling problems like this have been, and are being, solved by this remarkably versatile machine.

Contact us or your local Lees-Bradner representative for complete information on fast, precision threading with the Model HT Universal Thread Milling Machine.

Details on Worm Gear Production

Hob Spindle Speed	61 R. P. M.
Circular Pitch	1.420"
Pitch Diameter	3.728"
Outside Diameter	4.625"
Threading Time	1 hour 23 min.
Material	2315 Steel
Weight of Worm	51.76 lbs.

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Bureau, who I understand did much of the leg work in gathering the material.

We, who are concerned with promoting *active* interest in the training of skilled manpower, are sure you did a great service to the metalworking industry. Such an article published in a trade magazine that is so widely read as AMERICAN MACHINIST/METALWORKING MANUFACTURING can do no less than stimulate industry participation.

Charles F Hanna, *chief*
Division of Apprenticeship Stds
Department of Industrial Relations
State of California

Correction

Dear Sirs:

On your "Spot News" page (*AM/MM*—Apr 18 '60, p83), you carried an item which indicated that The Timken Roller Bearing Co was about to build a manufacturing plant in India. The impression conveyed by that item was erroneous. Such a plant is not now under consideration.

Your Indian News Bureau no doubt based its assumptions upon a recent market survey completed in India by our Export Manager. It should be pointed out, however, that such market surveys are being conducted almost continuously and are of principal interest to our various sales managers and distributors.

It is possible, of course, that the Asiatic bearing market at some future date might justify the building of a plant in India. Such plans are not presently in existence, nor are they contemplated for the foreseeable future.

R A Wagner,
mgr of public relations
The Timken Roller Bearing Co
Canton, Ohio

"Let us know if that check bounces."

CALENDAR

American Society of Mechanical Engineers—Semi-Annual Meeting & Aviation Conference, June 5-9, Statler Hilton Hotel, Dallas, Texas.

Society of Automotive Engineers—Summer Meeting, June 5-10, Edgewater Beach Hotel, Chicago, Ill.

Material Handling Institute—New England Show, June 6-8, Commonwealth Armory, Boston, Mass.

American Gear Manufacturers Association — Annual Convention June 6-8, The Homestead, Hot Springs, Va.

Joint International Powder Metallurgy Conference (MPIF & AIME)—June 13-15, Hotel Biltmore, New York, NY.

Drop Forging Association—Annual Meeting, June 26-29, Seigniory Club, Montebello, Quebec.

American Society for Testing Materials — Annual Meeting and Exhibit, June 26-July 1, Chalfonte-Haddon Hall, Atlantic City, NJ.

National Association of Metal Finishers—Annual Convention, July 22-24, Statler Hilton Hotel, Los Angeles, Calif.

American Machine Tool Distributors Association—Annual Meeting, Sept 3-4, La Salle Hotel, Chicago, Ill.

National Machine Tool Builders Association—Machine Tool Exposition, Sept 6-16, International Amphitheatre, Chicago, Ill.

Production Engineering Show, Sept 6-16, Navy Pier, Chicago, Ill.

Coliseum Machinery Show, Sept 7-15, Chicago Coliseum, Chicago, Ill.

Society of Automotive Engineers—Farm, Construction, and Industrial Machinery Meeting, Sept 12-15, Milwaukee Auditorium, Milwaukee, Wis.

American Die Casting Institute—Annual Meeting, Sept 14-15, Edgewater Beach Hotel, Chicago, Ill.

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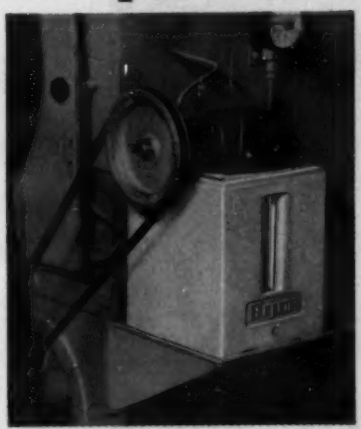
compact, efficient systems are easily installed, readily adaptable, trouble-free



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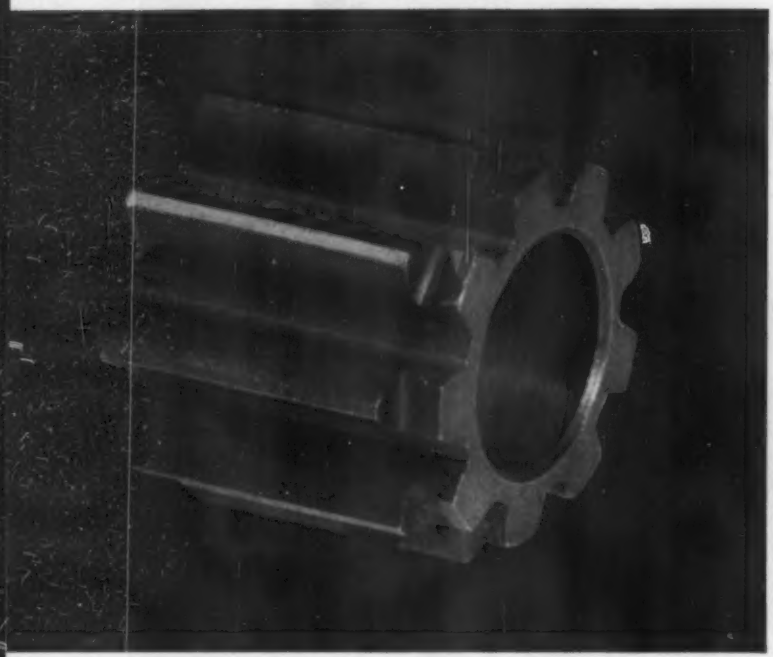
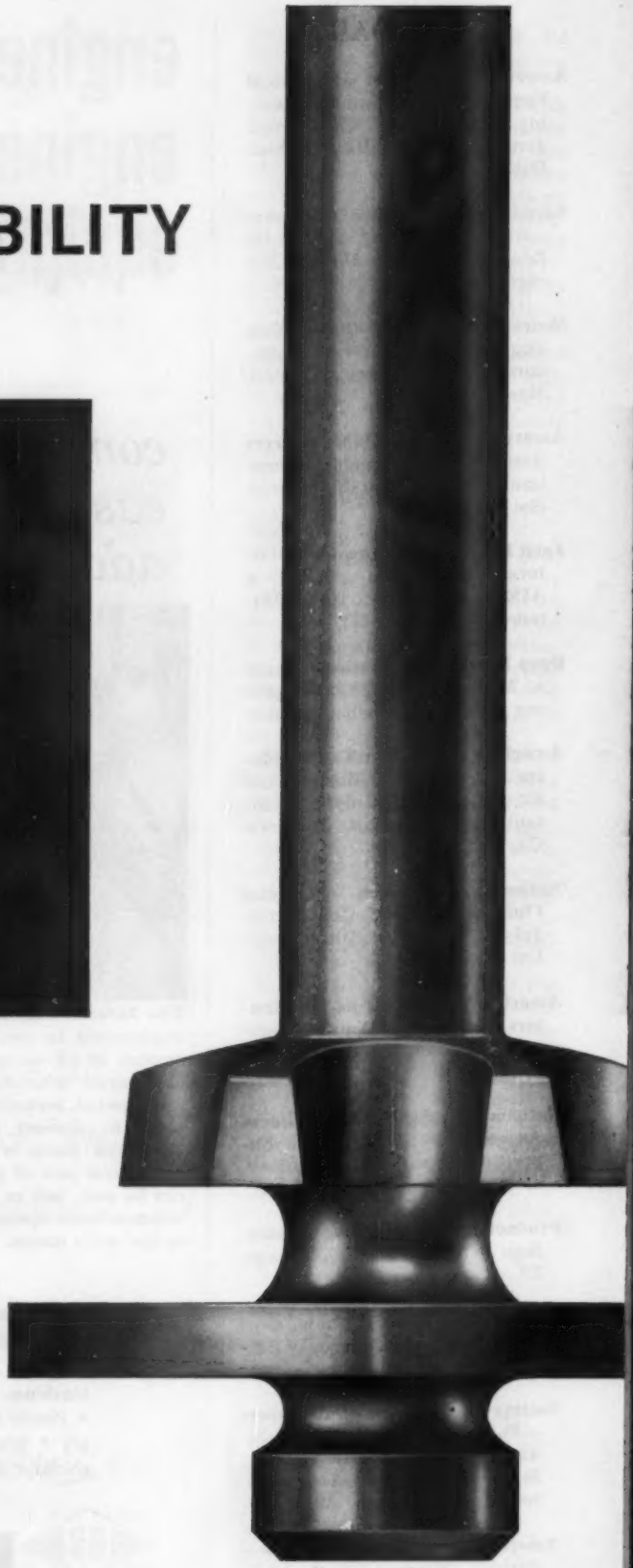




Choice: REPUBLIC 8617 ALLOY STEEL

In machining automobile starter drive pinions, Eclipse Machine Division, Bendix Aviation Corporation, Elmira, New York, uses Republic Cold Drawn Alloy Steel. Alloy bars are blanked, hobbed, chamfered, and drilled. Teeth are cut on a gear hobber, then pointed for easy meshing with the flywheel. In addition to greater strength and dependability, this cold drawn alloy steel gives Eclipse better machinability at reasonable cost. Send coupon for details.

Choice: REPUBLIC ENDURO® STAINLESS STEEL

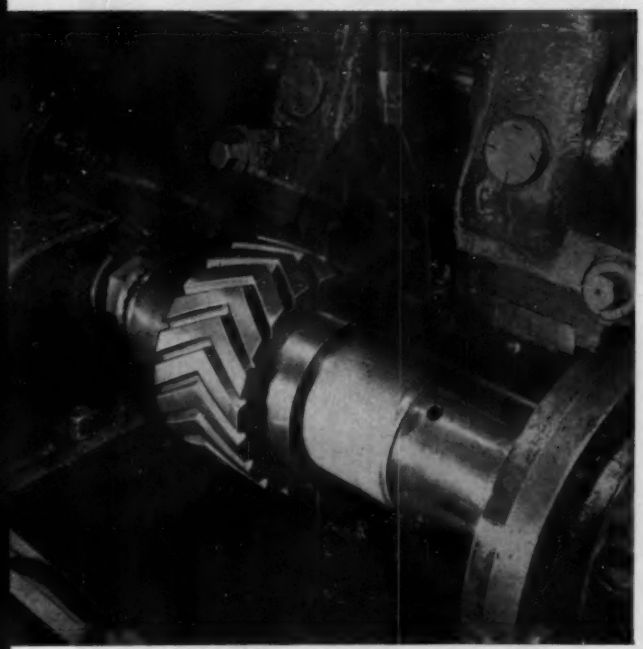
In machining one-piece Hyseal Valve Stems for new American-Standard single-lever mixing faucets, National Acme Company, Cleveland, Ohio, uses Republic Type 303 Stainless Steel. Completed in a single setup, 10 operations including a multiple end drilling of six holes on a 15° angle are performed in 12 seconds. For information on the more than 40 types of stainless steel available from Republic, mail the coupon.

Choice: REPUBLIC LEADED ALLOY

In machining heavy-duty herring bone gears, Philadelphia Gear Corporation, King of Prussia (suburban Philadelphia), Pennsylvania, uses Republic Type 4140 Hot Rolled Leaded Alloy Steel. Bars are rough turned on a lathe and heat treated to a 300 Brinell prior to gear cutting. Leaded alloy and carbon steels are available in almost every standard analysis and many specials. The addition of lead increases machinability as much as 25%. Heat treating assures adequate strength and toughness. Return the coupon for information.

Choice: REPUBLIC'S CENTURY SERIES

For high strength with varying degrees of machinability, Republic offers five grades of cold finished, stress relieved, carbon steel bars with a minimum yield strength of 100,000 psi. Selection of the proper grade—C-1144, C-1141, C-1151, C-1150, or C-1045—can result in substantial savings in machining and/or material costs. The CENTURY SERIES gives you dimensional stability with high physical properties in a range of chemistries. Mail the coupon for a free copy of Republic's CENTURY SERIES booklet.



CENTURY SERIES C-1144 Distributor Shaft
CENTURY SERIES C-1141 Hoist Support Shaft
CENTURY SERIES C-1151 Electric Motor Shaft
CENTURY SERIES C-1050 Axle
CENTURY SERIES C-1045 Shaft

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These youngsters are about to model the latest collection of "Cinderella" frocks for the junior set. This debut of new creations by Rosenau Brothers is the "Paris showing" of the children's market. New fashions often must bow at buyers' showings thousands of miles from the Philadelphia factory—just hours after the last stitch was sewn—or lose a big order. That's why Cinderella takes no chances—ships by AIR EXPRESS regularly. Only low-cost AIR EXPRESS assures overnight delivery coast to coast. These advantages could help you, too! Call AIR EXPRESS and be FIRST TO MARKET...FIRST TO SELL.

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CIRCLE 207 READER SERVICE CARD

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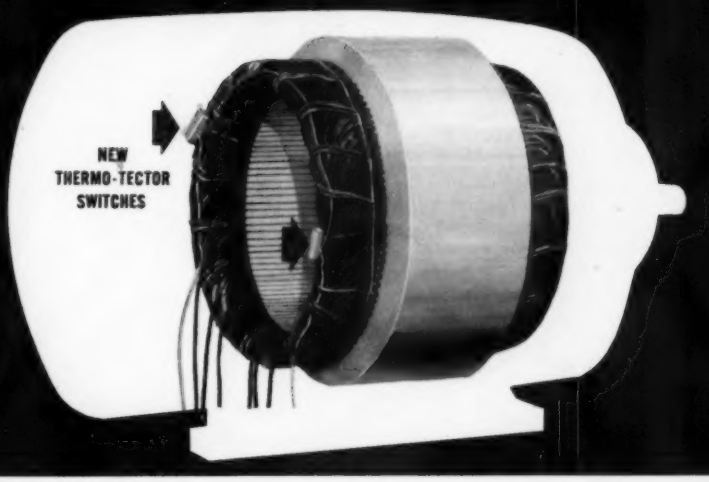
NOW!

GET MAXIMUM MOTOR OUTPUT WITH NO DANGER OF OVERLOAD BURNOUT!

New THERMO-TECTOR System
Operates IN THE STATOR . . .
Protects Under All Conditions!



You get *full output* from Tri-Clad '55' motors with Thermo-Tector protection. No operating "safety margin" is necessary since Thermo-Tector switches react instantly to prevent damage from *any* type of winding overload. New General Electric Thermo-Tector switches—buried deeply in the coils of the Tri-Clad '55' motor—are so durable they handle size 4 contactor coil current with *no costly amplifying relays.* Any conventional G-E motor controller works with the Thermo-Tector system.

Thermo-Tector protection is available on *all* Tri-Clad '55' motors in frames 254U-445U. For more information, contact your G-E Apparatus Sales Office or write for Bulletin GEA-7092, Section 866-2, Schenectady 5, N. Y.

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Developed Exclusively for Tri-Clad* '55' Motors

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ELIMINATES OVERLOAD BURNOUT

Allows Maximum Motor Output -- Safely!

Now—Tri-Clad '55' motors have simple, direct-acting thermal protectors that *positively* end winding failures from overloads!

New Thermo-Tector heat-sensing switches buried in stator windings react *instantly* to prevent heat damage. Unique Thermo-Tector "anticipation" feature varies motor shutoff point according to rate of winding heat rise. This ends need for operating safety margin.

Thermo-Tector system uses no costly amplifying relays or special circuitry, works with any General Electric motor controller.

*Registered trade mark of General Electric Co.

TURN PAGE FOR FURTHER INFORMATION

SPOT NEWS...

- **Ford's "compact-car" car,** referred to by the code name C-car, will be built in both U S and German plants, but design and tooling will be done in Cologne. The front-wheel-drive, four-cylinder car will be ready for introduction in late 1961.
- **Chance Vought Aeronautics Division** has received a $486,000 Air Force contract for a "theoretical formability" study of such metals as molybdenum, tantalum, tungsten, beryllium, and niobium. Study will enable engineers to predict by mathematical equations the forming limits of as-yet-untried superalloy and refractory metals.
- **A strike vote against Convair** has been authorized by members of the International Association of Machinists. About 92% of the membership voted to empower its executive committee to call a strike at Convair-San Diego and Convair-Astronautics when and if necessary after the contract expires June 5. Union is seeking a 14% pay raise over the next two years and fringe benefits.
- **A new alloy that looks like wrought iron** and can be cold-cast to shape but is as light as aluminum, was exhibited by American Smelting & Refining Co at the Design Engineering Show in New York. Company expects alloy to create new fashions in garden furniture.
- **Tungsten can be protected from oxidation** at temperatures of 3000 F and above for several hours by vitreous-bonded refractory systems developed at the University of Illinois. Systems may make it possible to take advantage of the high-temperature structural strength of tungsten by suppressing the rapid formation and volatilization of tungsten oxide.
- **Hot-forming dies of a special beryllium-copper alloy** have been developed by Republic Aviation Corp, Farmingdale, NY. The dies, cast in ceramic molds, retain high strength and "very good" mechanical properties at high temperatures. Used on a press especially developed for this operation, the dies are being used to form titanium and a variety of other space-age metals. A number of parts formerly machined from solid, and requiring as much as eight hours to cut, are now formed in five minutes from sheet.
- **Metal-bonded titanium oxide parts** with rupture strengths of 80,000 psi, and TiO-alumina-chromium compositions with strengths to 120,000 psi, have been produced at GE's Metallurgical Products Dept Laboratory. The semi-metallic nature of these lower oxides makes it easier to bond them to metal.
- **Electrically heated platen presses** for molding plastics at 1000 F will be needed in aircraft and missile work. Power supply will exceed 100 kva, special switching arrangements will be required for maximum heating efficiency.
- **Detroit Bevel Gear Co,** a division of Napco Industries, Minneapolis, Minn, will shift at least a portion of its operation to a new plant at Chembur, near Bombay, India. Production is scheduled to begin by September 1961. Initially, plant will turn out 10,000 tons a year of gears, crown pins, universals, and other auto parts. Output is expected to triple at a later date.
- **Japanese bearing manufacturers** expect the U S to buy about $6 million worth of their bearings in 1960. The presidents of practically all Japanese bearing firms have been, or shortly will be, in the U S to conclude new distributor contracts. Boeing Aircraft is expected to buy miniature bearings (3-7 mm dia) through a U S subsidiary of Koyo Precision Machinery.
- **Soviets report that 100 automatic lines** will be installed in the Republic of Armenia's factories during the Seven Year Plan ending with 1965. Automation will account for almost two-thirds of the total production increase.

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. . . millions of tiny holes—precision-drilled by rugged, long-life Morse "Electrolized" Tools for Philco's fabulous Transac.

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Philco uses the tools that are armored for rugged action: Morse "Electrolized" drills. More durable than high speed steel . . . more flexible than carbide . . . savers on down-time, replacement.

Morse will help you, too. Tell your cutting tool problem to your Morse-Franchised Distributor. He's the man with the answers.

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Morse means more production . . . smoother, more accurate production . . . with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want *Morse Quality*, there's only one way to get it . . . *specify Morse.*

VN

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WASHINGTON...

Johns Hopkins Report released . . .

The Pentagon's release of the highly touted Johns Hopkins Operations Research Office Report to the Army on machine tools (AM—Jul 27 '59, p89) is "sanitized"—all tabulations on military tool inventories are omitted. But the basic recommendation was published: that the Army spend $175 million over the next five years to replace obsolescent machine tools.

What happens now? Pentagon insiders say nothing. The Army's official comment is that the report will be "reviewed and evaluated" before a decision is made on how to implement the recommendations.

But this is apparently government globbledygook for the fact that the report will be shelved.

For one thing, the report proposes the replacement of idle tools. This runs smack into the government's budget policy of replacing only active production equipment.

Pentagon production experts are also skeptical over the report's emphasis on specific numbers of tools to be bought and specific sums of money to be spent. Says one official: "Before a flat estimate of tool requirements can be stated, a thorough analysis of end-item requirements, the savings tool replacement would produce, and the like, must be made. So far such an analysis has not been prepared."

The most obvious Defense Dept objection to the recommendation is the amount of money proposed for expenditure on tool replacement. Current military spending for tool replacement doesn't exceed $15 million a year. Exact figures are hard to come by because of continual budget shuffling and because some agencies lump replacement funds with budgets for end-item procurement and installation of new production lines.

Few if any Washington officials envisage the time when the Pentagon, strapped by missile gaps and budget restrictions, will be allowed to spend such amounts of money for tool replacement—a program most military strategists now consider a "luxury."

Still, the Johns Hopkins Report will provide authoritative ammunition for the Pentagon experts who have long fought the battle for tool modernization and replacement. Indeed, the reason behind the study's authorization in 1957 was no doubt to educate the Army's powers-that-be on the strategic advantages of keeping the production base as up-to-date as stockpiles of armament.

Export-stimulus plan dragging . . .

Washington insiders complain that the Administration's big drive to expand exports of U S goods is accompanied by much ballyhoo and little tangible results.

Major feature of the Administration's program is short-term insurance to exporters against political risks such as losses due to a change in government or from monetary devaluations. Some exporters complain this has only minor benefits—for exports to unstable and underdeveloped countries. They say it does little to open new markets in the big European nations and others with advanced economies.

Commerce Dept plans to step up the hoopla over exports. But many in Congress are skeptical about the results. They would like to extend the program to spur exports by providing exporters insurance against all commercial losses. Non-payment of debt by a foreign customer, for example. The White House so far is cool to this scheme.

Summit failure and defense budget . .

Heightened international tensions resulting from the collapse of the summit talks in Paris have generated calls for a step-up in defense spending. Exploiting the new crisis atmosphere here, Pentagon pros are plumping for extra funds.

Even before the crisis, Congress seemed certain to appropriate more money than the Administration sought—for Polaris subs, the Minuteman ICBM, an airborne bomber alert, military satellites, and transport aircraft. But the House has offset these increases by trimming the Bomarc B, an aircraft carrier, and general procurement funds. Now it's possible the funds will be restored in the Senate and a hefty increase voted in the total budget.

But as of now, the Administration does not want to be pushed into any dramatic increase in military expenditures. Officials take the view that defense efforts are programmed for the long pull, are adequate to maintain the balance of deterrence, and need not be adjusted to every diplomatic crisis or thaw.

If events seem to warrant it, however, the Administration might make some operational moves aimed to impress the Soviets with our willingness to call any military bluffs. This would involve extra deployments of troops and naval units and accelerated flight operations, rather than significant hike in hardware procurement.

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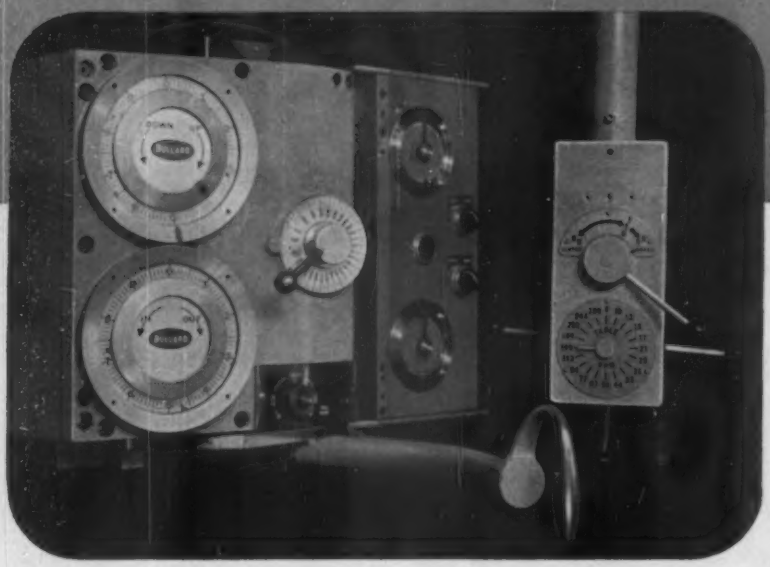
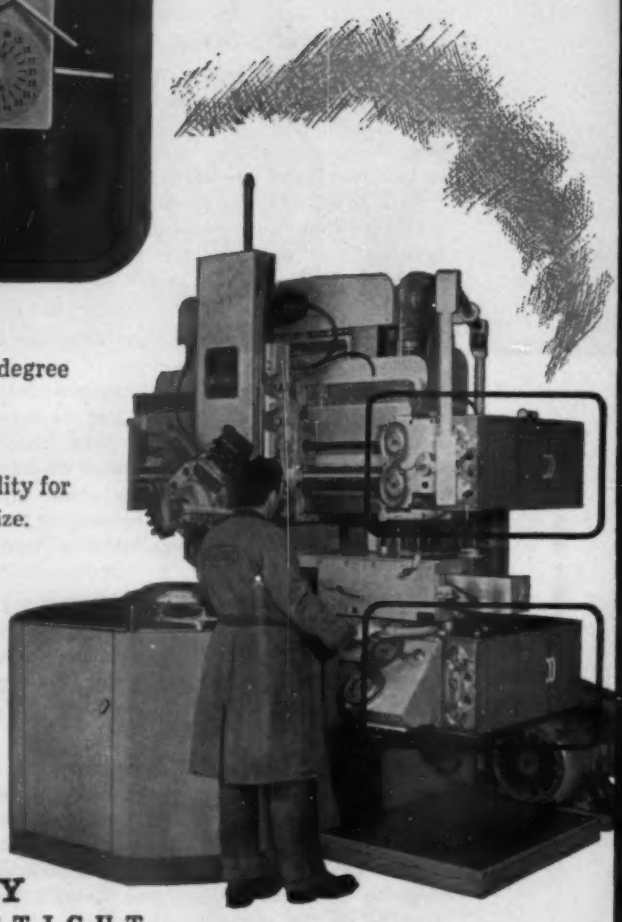
revolutionary new feature of

Bullard DYNATROL*

VERTICAL TURRET LATHES





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repetitively accurate to within .0003, increases productivity by cutting time between cuts.

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DETROIT...

A good year...

The 1960 model year, now estimated to run slightly over 6 million units, is a sure bet to be the best on record since 1957. Calendar 1960 should equal 6.8 million if an expected 500,000 imports are included.

Biggest upset, of course, has stemmed from what one authority has rightfully called an "explosion" in domestic-built compact car sales. It is notable that these are currently outselling foreign cars by a 2-to-1 margin in such import-addicted areas as the northwest and southwest Pacific states. One out of every four car buyers is currently choosing one of the six domestic compact makes.

According to Chrysler VP Byron J Nichols, American compacts will climb to 35% of the national market this fall when four new makes will be introduced. Nichols went on to admit that the onslaught of boating, swimming pools, and European vacations has seriously threatened the niche in the family budget once held by elaborate motor cars.

Who's hurting?...

With the exception of pure sports cars and four other makes, imports are skidding badly. Spot market checks in two formerly hot areas—Miami and California—show sales off a whopping 50%. Nationally the 500,000 forecasted sales for 1960 indicate a 100,000-unit loss. The hot sellers continue to be Volkswagen, Renault, Peugeot and Mercedes; those in most trouble include Simca and Hillman.

Corn is corn...

Next September 12 or thereabouts the sleepy oil-rich town of Flora, Illinois, will crawl with 1600 spanking new, 1961-model Ford cars and trucks, enough to temporarily replace every vehicle now owned by the 6300 residents.

The idea is to let Mr and Mrs Average America (Flora is the population center of the U S) try out Ford products for five days, then expose them to the questions of 270 of the nation's auto writers who will be flown in for the event. Even the local Buick dealer said that he would put Fords in his showroom during this period.

Surprise announcement of the unique program came at a jam-packed annual Chamber of Commerce dinner at the local American Legion Hall. For a moment the audience thought they they had each been given a new car to keep. The lesser realization, still brought an ovation.

Ford dealer A R Smith happily estimated a three-fold increase in his usual 16 car per month sales pace. Only the Chevrolet dealer remained silent—he did not attend the meeting.

Mistakes come high...

Chrysler's director of quality control, C G Bauer, recently revealed some interesting figures on the cost of mistakes.

A certain small interior accessory costs ten cents to install. If it's discovered to be defective at a later inspection point on the assembly line, the direct labor cost of replacing it rises to $1.50. But if it gets out of the plant and must be replaced through dealer warranty, it costs $7.50.

Engine parts can prove even more of a headache. One that costs two cents to install can be corrected at the engine plant for $2, or later at the assembly plant for $18. Once out in customer hands, though, this same defective two-cent part costs $100 to replace. "Fortunately," Mr Bauer notes, "an improper installation of this kind is so rare as to be almost non-existent."

Dodge lancer...

Dodge Division's General Manager M A Patterson some time ago officially confirmed that his firm would market this fall a new small car to be called the Lancer. This does make it true. DeSoto, on the other hand, was credited in a car-enthusiast magazine with still another compact to be called the "Adventuress." Not true.

The new Lancer will provide Dodge dealers with a car that will compete feature for feature with L-M's Comet. Although the body shell and wheelbase (106.5 in.) are the same as the Valiant, the car will be about 8 in. longer overall. The hood will overlap a horizontal grill. All exterior sheetmetal except the roof will be distinctively different from the Valiant.

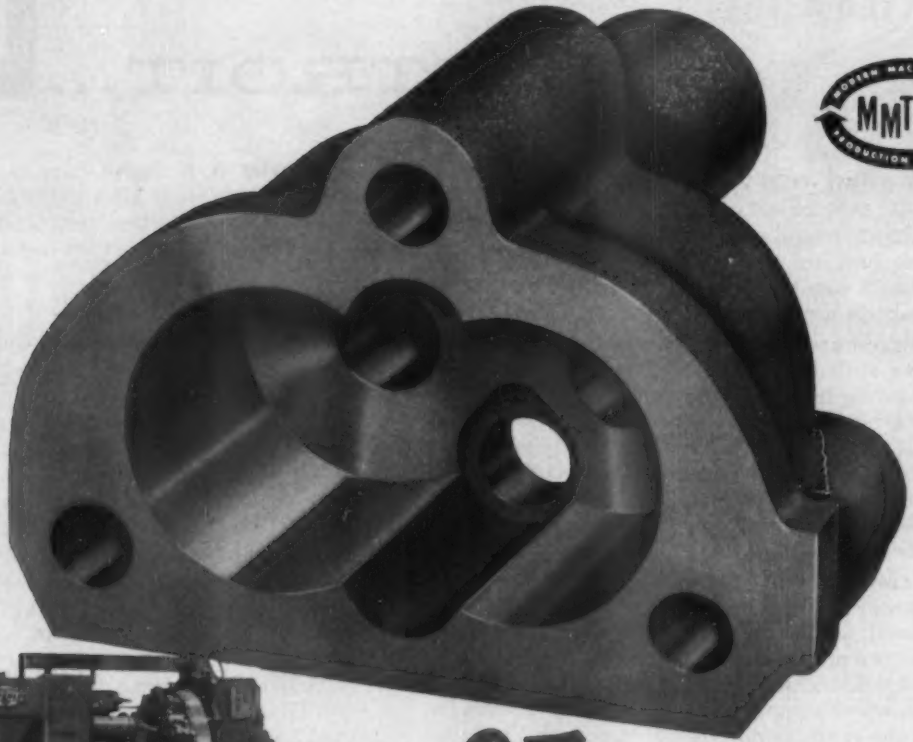
Reversing a trend...

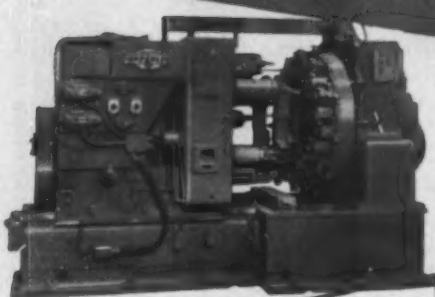
Detroit's Active Tool & Mfg Co became the talk of the industry here when it landed a $2-million order for finishing 250 dies (all major panels) for 1961 English Ford Prefects, including 4-door, 2-door, and hardtop models. Largest die weighs 27 tons. Conventional Kellering techniques will be used for all the dies. Also included in the contract are 10,000 production runs.

The firm beat European competition by promising November delivery. A spokesman for the company said that the St Lawrence Seaway made the order possible—***Don MacDonald.***

. . . an example of Automatic Production by Greenlee . . .

MMT-PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY





97 cast iron oil pump bodies an hour

This Greenlee 12-station, horizontal indexing machine rough and finish machines cast iron oil-pump bodies for a leading auto producer at the rate of 97 pieces per hour. Indexing is fully automatic. Cycle time is 37.2 seconds. Tolerances of ± .001" for boring depth and ± .0005" for ream hole size are maintained.

STATION 1 — load, unload
STATION 2 — drill
STATION 3 — drill
STATION 4 — drill, chamfer
STATION 5 — rough bore
STATION 6 — rough ream
STATION 7 — rough bore
STATION 8 — semi-finish bore
STATION 9 — semi-finish bore
STATION 10 — finish ream, finish bore
STATION 11 — finish ream
STATION 12 — finish ream, finish bore

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AIRCRAFT and MISSILES... TRENDS

A F to buy more transports...

Under Congressional pressure to do something about the inadequacy of airlift for combat troops and equipment, the Pentagon seems likely to begin buying larger numbers of transport Aircraft over the next year.

The outlook is for the new production orders for Lockheed's C-130E turboprop and Boeing's C-135 (a cargo version of the KC-135 jet tanker), and a design-contract award for a new cargo jet.

The Administration's original budget for fiscal 1961 provided only $70.4 million to continue production of the Lockheed C-130B tactical transport plane (the total production run comes to about 200) and $50 million for research and development on a new cargo plane—the so-called "SOR" (Specific Operational Requirement) aircraft. This would function as a tactical military transport, with airdrop capabilities, as a strategic carrier with longer range, and be suitable for commercial cargo operations.

A House Armed Services Subcommittee, under Rep Rivers (D, SC), which has conducted a broad-gaged inquiry into U S military airlift, recommended the addition of $385 million for immediate procurement of 50 C-130Es (which with pylon tanks become long-range strategic transports) and 50 C-135s.

The House Appropriations Committee, however, tacked on $250 million to the Air Force appropriation to buy 50 C-130Es, with the balance of the extra funds to be spent on the C-135 (this would be enough for about 24 planes) or an aircraft of "similar capability."

The Air Force plans to use the extra funds to buy 100 new aircraft. It intends to seek more money next year to round out the program if the Senate fails to boost the House's sum.

Odds are Boeing's C-135 will be bought, but the Air Force is still considering a cargo version of Douglas's DC-8. But experts put the damper on this, claiming conversion would cost too much. The Army is pushing for all-out procurement of the C-130 turboprop since it can be modified into both strategic and tactical carriers—with the latter version capable of airdrop and assault operations.

The Air Force is thinking in terms of first deliveries in early 1962 with completion in late 1963.

Status on "SOR" aircraft...

The C-130E and C-135 are considered only "interim" aircraft in the Air Force plan to modernize airlift forces. The SOR aircraft, on the other hand, is envisaged as the plane of the future. It would carry 40,000 lb of cargo non-stop over the Atlantic (4600 mi) or 20,000 lb non-stop over the Pacific (6270 mi). It would have a minimum speed of 506 mph, and land and take off over a 50-ft obstacle on a 5000-ft runway.

As the specs now stand, the new plan would cut direct operating costs by 50% to 4-5 cents per ton-mile; for users this would run to 10-12 cents per ton-mile.

Seven aircraft companies have submitted ten different preliminary design proposals on the advanced cargo aircraft—both turboprop and turbofan versions. A design award will probably be made shortly after July. If the plan works out according to schedule, first deliveries would be possible by fiscal 1964.

Lockheed Marietta gets space job...

Lockheed Aircraft Corp's Georgia Division at Marietta has landed its first space work. The division has been awarded a contract to manufacture components for the 1.5-million-lb-thrust first stage of the Saturn booster. The Saturn first stage will be assembled and tested by the Army Ballistic Missile Agency at Redstone, Alabama.

"This contract is good news for us," says division manager Dick Pulver, "as it puts us modestly into space work. If we do our expected good job, there should be follow-on business."

Air Force expresses concern...

The Air Force is concerned over its lack of ballistic missile assembly, test, and launch capability. It has relied on contractors to handle these functions in research and development launches. Contractors are still used as an important supplement to test and training activities at operational bases.

Major Air Force effort to increase its capabilities may come in the Dyna-Soar program.

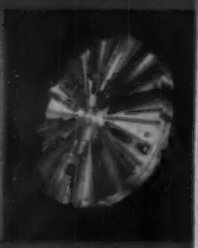
Supersonic trainers...

First Northrop T-38 Talon supersonic jet trainer will be delivered to USAF's Air Training Command, Randolph AFB, Texas, in January 1961, with the first operational planes going to Webb AFB, Texas, in July 1961.

Production plans at Northrop's Norair Division, Hawthorne, Calif, call for a total of 744 T-38s, with 69 funded in fiscal 1960, 144 in fiscal 1961.

Attention
missile
tooling
engineers

CUSHMAN



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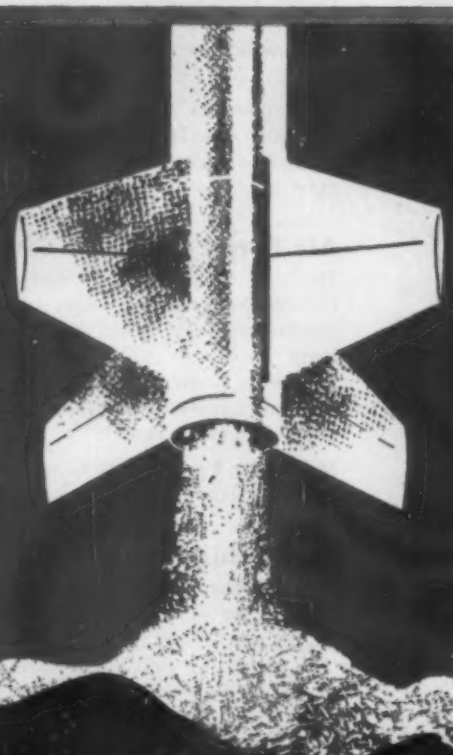

THE CUSHMAN CHUCK COMPANY · HARTFORD 2, CONN.

MACHINE TOOLS...

Users seek speedy action...

The Machine Tool Users' Coordinating Committee intends to press for speedy action by machine tool builders in setting up joint committees to work out standardization of certain working areas of general-purpose machine tools.

It would like the selection by June 1 of a machine-tool builder as a co-chairman of the Coordinating Committee and three builder representatives for each of the four sub-committees on turning machines, millers, grinders and drilling machines.

This is in line with the proposal to members of the National Machine Tool Builders' Association in New York on May 5.

Despite the conciliatory words and attitude of the Coordinating Committee's chairman Robert Witsche of International Harvester at the final NMTBA session, representatives of the Committee have made known privately their intention to proceed unilaterally to establish the desired standards without builders' participation if builders choose "to drag their feet." They then would begin to buy machine tools on the basis of these standards.

The Users' Committee representatives repeatedly stress the fact, however, that they would much rather achieve their standardization goal by cooperation of builders than by any other means.

They even are ready to shift the organizational setup if builders will cooperate.

Following the Users' Committee presentation at New York, the interested groups of builders—lathe group, milling-machine group, drilling-machine group, grinder group—met and discussed the appropriate action that each felt should be taken.

Each group plans to report to the NMTBA board of directors what it proposes to do.

European acquisitions continue...

Acquisition of manufacturing facilities abroad is still in progress in the machine-tool industry.

A prominent U S builder is well along in negotiations for control of the largest grinding machine company in France. And an eastern U S builder is reported close to an agreement with a West German company to build its heavy machine tools on a contract basis.

Pratt & Whitney has announced that it will build a plant in Italy, south of Rome, to make its machine tools, cutting tools, and gages, with Finmeccanica of Italy having a minority interest in the operation.

Special shows for distributors...

Several machine tool builders have been staging special shows for their distributors to see their new machines to be on display at the Machine Tool Exposition in Chicago September 6 to 16.

Visits to builders' plants confirm the fact that most builders will be showing tape-controlled machines at Chicago. In certain cases, makers of numerical-control units have held out special inducements to builders to use their control systems on their machines.

"Package" maintenance deal...

One manufacturer of numerical-control units is offering to users of its units a so-called "package" preventive-maintenance deal. For a specified sum for the first year of usage, the customer's unit is thoroughly inspected four times. In case of a breakdown, a service man or team is guaranteed to be on the job in 24 hr or less.

AFL-CIO views tool industry...

Professor Seymour Melman of Columbia University talked about the Soviet machine tool threat to the West, including the United States, at a recent meeting in Washington of the Machine Tool Joint Industry Committee of the Industrial Union Department of the AFL-CIO.

Local unions from machine-tool companies are reported to have sent delegates to this meeting. The Industrial Union Department's research section revised its statistical analysis of the U S machine-tool industry, first made last year, for this meeting.

The union's experts regard the long-term outlook for the machine-tool industry as much brighter than the short-range prospect because of the high proportion of machine tools that must be replaced for users to stay geared to rapidly changing an advancing technology.

One thought-provoking comment of the union: "Most major U S builders are now conducting major production overseas for overseas markets, and no doubt eventually will export these tools from their new overseas plants to the United States."

METALOGICS AT WORK

How Ryerson helps stainless user cut costs

Production costs for a manufacturer of stainless steel fittings were high—and rising. Parts were being machined from 1-inch round, cold drawn Type 304. Its relatively slow machining speed made blanking, drilling, threading and roughing out slow and costly. Management considered that switching to 30% faster machining Type 303 would bring costs back in line. **A BETTER ANSWER:** this boost in machining rates looked like a good answer—but was it the *total* solution? With their Ryerson Representative they studied the problem further, and realized that service demanded of their fittings didn't require all the corrosion resistance of the 300 series. On the recommendation of Ryerson, they switched to Type 416 and gained *two* ways. It gave them a much higher machining rate—*100%* faster than type 304—*and* saved many dollars a ton in material costs.

There may be another stainless that will do *your* job faster, better, at lower cost. Ryerson offers *more* types, shapes, sizes, tonnage—and the knowledge of when and where to use them. Ryerson can handle your mill orders, too—saving you time and trouble at no additional cost.

Always be "Metalogical"—call Ryerson.

METALOGICS

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MATERIALS...

Inland increases coil output...

Electrolytic tinplate production at Inland Steel Co is presently restricted to sheets. However, a program is underway to enable Inland to process two-thirds of its tinplate in coils. With two lines producing sheet tinplate, the company last year began construction of a third electrolytic tinning line scheduled to start coil production late this summer. Now company officials tell us that the No. 2 electrolytic tinning line at the Indian Harbor plant in East Chicago, Indiana, will be revamped and should be producing coil by the summer of 1961.

A capacity of 11,000 tons a month will be provided by the revamped line, compared with 14,000 tons of monthly capacity expected from the company's new third line. Part of Inland's $80-million capital investment program for 1960, the tin mill expansion and conversion will provide an annual tinplate production capacity of 435,000 tons.

High-temperature vinyl...

Sixty-degrees Fahrenheit is enough of a temperature increase to cause tremendous optimism for a new polyvinyl dichloride plastic developed by B F Goodrich Chemical Co and the Goodrich Research Laboratories. Because the new vinyl plastic can withstand temperatures 60 F higher than conventional vinyls, it can be used in household hot-water plumbing systems and even in industrial hot-acid piping.

Opening new horizons for vinyl, this higher heat resistance means that for the first time vinyl can take over functions in the building, chemical processing, automotive and many other industries, that were formerly the exclusive domain of metals. Tradenamed hi-temp Geon, the material's first commercial production, sometime next year, will go into household and industrial plumbing. It is expected to open a multi-million-dollar plumbing market to the plastics industry. Pipe made from high-temperature vinyl should cost no more than, or slightly less than, copper pipe, according to Harry B Warner, president of B F Goodrich Chemical Co.

Compounded to withstand 180 to 200 F at 150 psi pressure, the material is one-sixth the weight of copper. It has much lower thermal conductivity, hence reduces moisture condensation on the outside of water lines and helps maintain higher temperatures in liquids it carries. Impact strength and resilience are sufficient to absorb shock and stresses during field handling.

Either socket solvent-cemented joints or threaded couplings can be used to join the plastic pipe. It can be cut with an ordinary woodworking saw and formed to desired curvatures by heating. The new pipe lends itself to prefabricated plumbing systems and may prove a boon to the "do-it-yourself" market.

Applications foreseen for hi-temp Geon include pipe and fittings, plumbing hardware, shaped pipe and ducting, missiles and rocketry, camera cases, household appliances, and automotive parts such as glove compartments, hoods, and rear decks. Like conventional vinyl (polyvinyl chloride), the polyvinyl dichloride can be extruded, molded, formed or stamped on conventional plastic-processing equipment. Only raw material will be available from Goodrich.

Prodigal parts makers come home...

Founded in 1957 as an independent trade association, the Power Metallurgy Parts Manufacturers Association has united with the Metal Powder Industries Federation. Representing the contract manufacturers of powder metallurgy mechanical and structural components, plus self-lubricating bearings, the PMPMA thus becomes the sixth of the Federation's autonomous trade associations.

Long divided, to the extent of supporting two separate trade organizations, the contract-parts manufacturers agreed to unite with the Federation at the latter's 16th Annual Meeting in Chicago, April 25-27. Members of both groups now constitute a new "Powder Metallurgy Parts Manufacturers Association," operating within the framework of the Metal Powder Industries Federation. This much-to-be-desired merger is welcome evidence of the maturity developing in this industry.

Today, all of the major producers of powder metallurgy parts, both in-plant (captive) and contract, are willing to work together toward the development of the industry through the Federation.

Electromechanical research for steel

Control systems for both new and existing processes in all steelmaking functions will be developed at U S Steel's new electromechanical laboratory, which opened in Monroeville, Pa, this month. The staff of engineers and scientists will also search for better methods of controlling chemical and metallurgical properties of steel. Typical of this kind of research is the Corporation's new structural mill in the Chicago area. It is designed for electronic program control.

CAREFUL!

With the sure, *careful* touch of an experienced hand, veteran CTW heat-treat man hoists 72" broach from a vertical furnace.

Care in the creation of Continental Broaches takes precision manufacturing a step beyond the exactness of quality control. Thirty years of broachmaking—designing and producing thousands of standard and custom-made broaches—assures *unmatched* efficiency and performance from CTW Broaches.

Find out how Continental's experience in broach engineering, modern heat treat methods and cost-saving production processes can cut down-time and increase output in your operation. Call your local Ex-Cell-O representative, or contact Ex-Cell-O Detroit; in Canada, Colonial Tool Co., Ltd., Windsor.

59-14

MMT-PE

CTW

Continental TOOL WORKS

DIVISION OF

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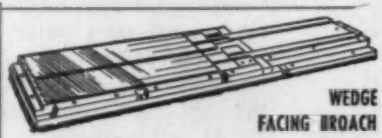
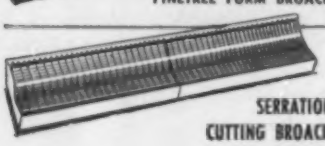
DETROIT 32, MICHIGAN

PINETREE FORM BROACH

SPIRAL SPLINE BROACH



WEDGE FACING BROACH



SERRATION CUTTING BROACH

INVOLUTE SPLINE SHELL-TYPE BROACH

CARBIDE-TIPPED BROACH SECTIONS

SEE EX-CELL-O'S BOOTH 946, NMTBA EXPOSITION

WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking production outlook is spotty...

Steel production continues to drop off around the nation, but auto production reached a three-month high. This some-up-some-down picture is characteristic of metalworking in general.

Preliminary AM/MM Production Index figures for April show that metalworking production fell short of the April estimate of 108 by three points. May activity is estimated to remain at this 105 level.

The Materials Handling Institute reports that dollar volume of orders placed rose five points in the latest month, reaching an index mark of 133.6 (1954 100). Individual manufacturers note some caution buying, however. But all expect the year to be a good one.

Tool and die manufacturers report a continued rise in sales and orders, although the high curve they have been on seems to be leveling out. Improvement over 1959 sales and orders continues at a good spread, but smaller month-to-month improvement has been noted. A slump is expected during auto model changeover in the third quarter. Several concerns report poor business, but even these expect 1960 to be better than 1959.

Three railroad car builders agree that business is steady and sales are good, although there is a slowdown in orders. All report higher backlogs than at this time last year.

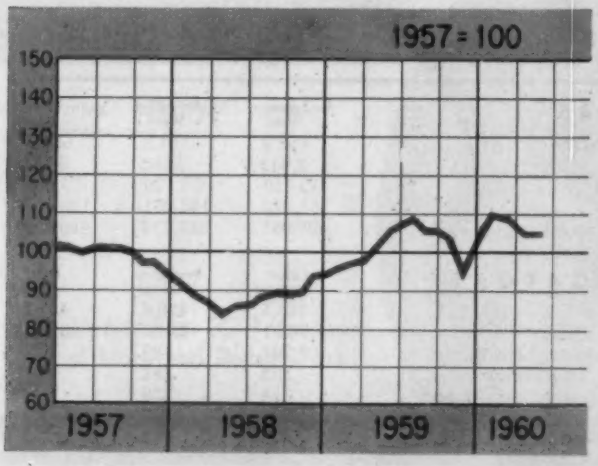
Those midwest heat treaters who are not in a slump at the moment have just come out of one. One concern reports that business is at its worst level in more than eight years. "We're hardly operating," a spokesman reports. The slump set in about three weeks ago; until then this plant was working on overtime schedules. Another operator reports his business is picking up after a "miserable" first quarter. The outlook, though, is still for 1960 to be up slightly over 1959.

Gear manufacturers in the Cleveland area report a brisk level of activity. May orders have slowed down somewhat, but optimism runs high for a year-end improvement of 20 to 25% over 1959. Original equipment is accounting for most of the orders.

Metalworking job shops around Chicago report business steady and prices firm, although one company said prices, on the whole, have been climbing. General opinion is that business will equal or be slightly better than last year.

Appliance manufacturers offer conflicting reports. One says business is down 10-20% from last year and down 5-10% since the first of the year. Another reports that its home laundry units are off 16%. A third manufacturer says that business is up 2-3% in the last month, up about 5% from last May. All look for a 5-10% increase for the year as a whole.

Foundry operations are spotty. Some foundrymen report six-day work week schedules, others are on reduced schedules. Gray iron founders are operating at about 85.4% of maximum demand, may go even slightly lower. But they expect an overall gain of 5% for the year. Malleable founders have been operating at about the 70-80% mark for most of the year, and have not had a chance to build up a backlog. Predictions for a 12-15% gain in operations over 1959 now appear to be optimistic. A 10% gain now seems more likely, but even this is uncertain.

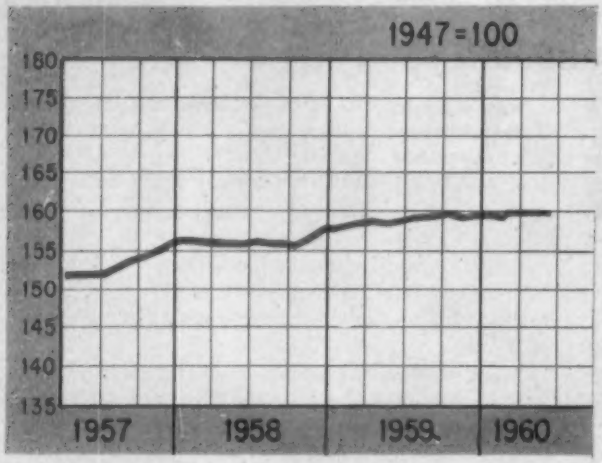


AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**105**	**105**	**107**	**105**
Electrical Machinery	104	104	97	
Machinery	113	115	103	
Autos	116	118	108	
Other Transportation	88	87	95	
Other Metalworking	107	110	105	

TRENDS WHAT'S AHEAD... in Business



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total index	**159.8**	**159.8**	**159.7**	**158.7**
Metalworking Machinery	**190.4**	**190.4**		**184.2**
Other Machinery exc. Electrical	**173.0**	**172.6**		**169.6**
Electrical Machinery	**162.3**	**162.2**		**159.3**
Fabricated Metal Products	**147.9**	**148.0**		**148.8**

Indicators point to better business...

Gross national product for the first quarter of the year hit an annual rate of $500 billion—the half-trillion dollar mark—according to final government estimates. By this time the GNP is well beyond that mark and promises to grow steadily through the year. This prospect is supported by some other indications of business activity in recent weeks.

Employment, for example, jumped substantially during April, and unemployment dropped. One reason for the improved employment picture: Workers in construction were able to return to projects delayed by a stretch of extremely bad weather in the final weeks of winter.

And in the retail trades employment was boosted by the substantial increase in sales during April. On a seasonally adjusted annual basis, retail sales for April were 3% ahead of the previous month and up by 5% from the level of April 1959.

Rising employment joined by rising pay scales in many industries sent personal income to a new record level. During April, total personal income climbed beyond the $397-billion annual rate level. The increase for the month was $3 billion, the best gain registered so far this year.

Topping off the list of favorable developments is the report that industrial output has stopped declining. During April, industrial production as measured by the new FRB index stayed at the 109 level set in March, halting a two month decline.

These developments aren't surprising. They simply confirm earlier forecasts of a steadily rising business volume right through the rest of 1960.

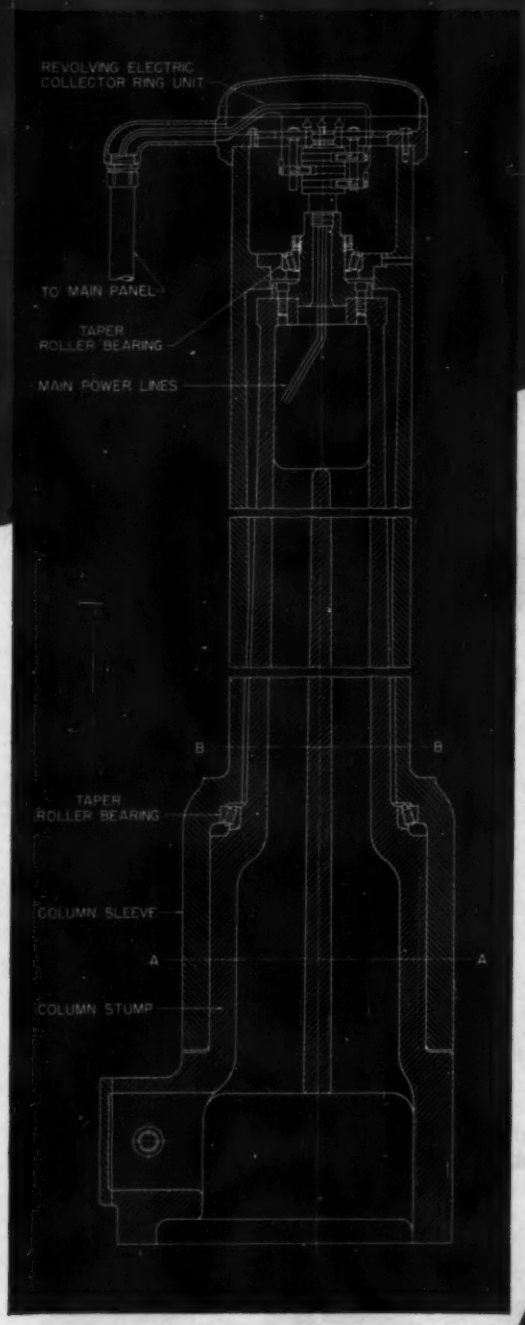
To the already-record levels of business chalked up in the early months of 1960 add: rising expenditures for plant and equipment; substantial increases in consumer spending as incomes grow; a stepup in homebuilding activity in the coming months. There you have the ingredients for healthy gains in production and business in general for the rest of the year.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	152.4	151.6	153.1
Steel ingot operations (thousands of tons)	2,042	2,102	2,644
Electric power output (million Kilowatt hours)	13,350	13,139	12,684
Production of automobiles and trucks	151,320	142,091	135,856
Engineering construction awards (Eng. News-Record—thousands)	497,986	385,774	468,223

QUARTERLY BUSINESS INDICATORS	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	483.5	478.6	457.1
Expenditures of new plant and equipment (millions)	36.91	35.32	32.51
Profits after taxes in primary iron and steel industry (millions)	204	–89	324
Profits after taxes electrical machinery industry (millions)	352	291	301
Profits after taxes in motor vehicles and parts industry (millions)	314	229	441
Profits after taxes machinery (except electrical) (millions)	282	345	219
Motors and generators new orders index (1947-1949=100)	155	169	169

* Seasonally adjusted

Rigidity Increased 50%



New thrust resistant, "TIMKEN" mounted column and sleeve assembly.

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A new "NON-CREEP" clamping mechanism in combination with a solid column sleeve cuff adds greatly to the rigidity of this new "AMERICAN" Radial.

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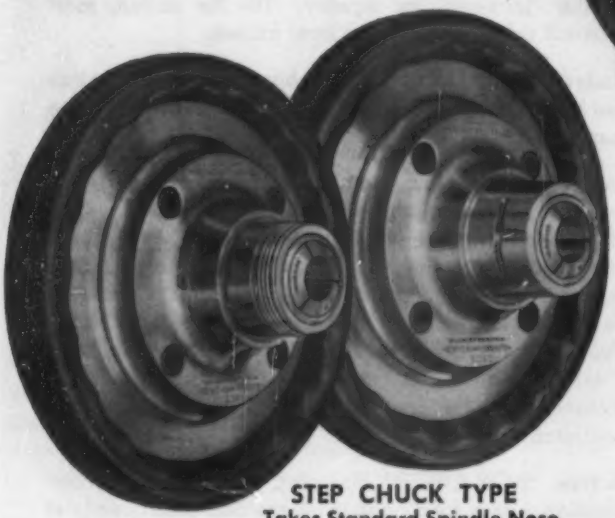

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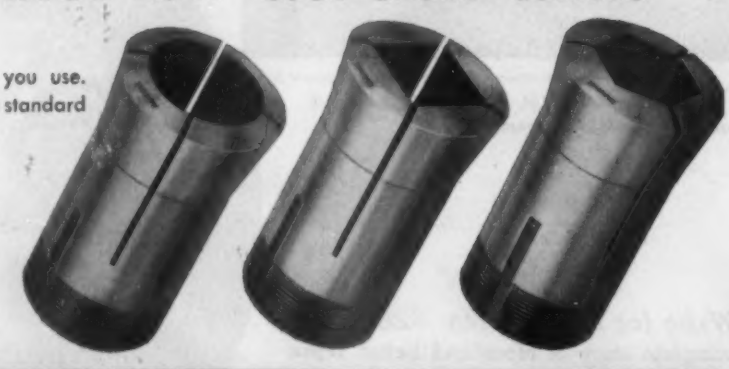

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American Machinist | Metalworking Manufacturing ESTABLISHED 1877

Little To Fear In '60

It has become a popular pastime to apply a derisive term to the decade into which we are entering. The Soaring Sixties have suddenly been labeled the Sickly Sixties and the Sinking Sixties.

This switch is easy to fathom. Late last fall and at the year end there was a loud chorus of super-optimism, led by professional economists. You might have thought that the new year was about to usher in the economic millennium.

It was overdoing it a bit . . .

and raised false hopes about 1960. And then came the stock market break that scared a lot of people.

Before we go on a crying jag, however, it might be helpful to look at the facts.

Metalworking has been operating all year at or close to its peacetime peak. On the whole, it has scarcely ever done better. Figures prove it.

The automobile industry has consistently produced cars at a rate far above 1959. This year probably will end up as the second best in history, yielding first place only to fabulous 1955.

Engineering construction awards . . .

have stayed far above the year-ago level. So have retail sales.

American industry will be investing this year about 16% more dollars in new plant and equipment than in 1959, the recent survey of the McGraw-Hill Department of Economics shows. What's more, manufacturers have enlarged their ideas about spending just since the first of the year. They likewise are planning on a high level of investment right through 1961, 1962 and 1963.

You can compare almost any index's current figures and they are up from a year ago.

Steel, it is true, is not doing well by those who predicted that it would perform a production miracle this year. But don't discount too much its final showing for 1960, which may well be the second largest in tonnage in history.

Actually, steel's performance fails to reflect Metalworking's excellent current output. Steel users have been lulled into letting their inventories drop sharply by the seeming assurance of no strikes in the mills the next few years. So users once again are relying upon the mills to carry their stocks for them.

This recital of facts . . .

is evidence that Metalworking is not in the Sinking Sixties any more than it is in the Soaring Sixties. There is no use pretending that everything is wonderful, because there are segments where it isn't. The machine tool industry happens to be one of these sectors.

Business the last half of the year may not be as good as the first half. At least that is what the crystal-ball gazers say. But at its worst, it promises to be pretty good.

The point is that metalworking operations are in a healthy condition and show no signs of plummeting. A lot of business is to be had if management will go after it with vigor, courage and resourcefulness. But on top of these virtues you must have a product that is up-to-date in design, is priced right, and is what your customers want and need.

If you have this combination, you have little to fear in '60.

Burnham Finney EDITOR

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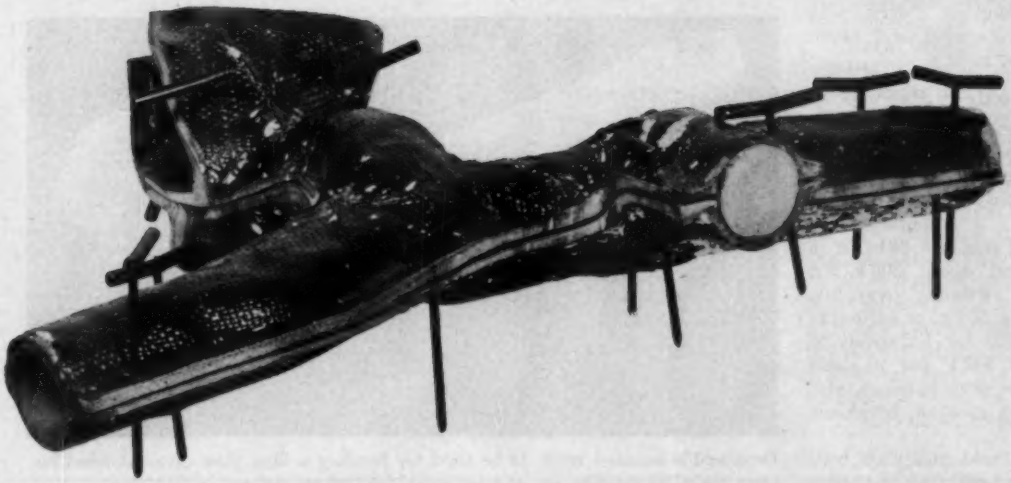


Making a mold for a destructible mandrel: Epoxy L-953A resin is cast around a model (above), is then beefed up with fiber glass (below) and the mold ends (except the gate end) are sealed off with Kirksite plugs. Mold is now ready for pouring

You can wash-out, melt-out, or break-out and reuse new plastic...

DESTRUCTIBLE MANDRELS

The old chestnut about the man who builds a boat in his basement and can't get it out without knocking down a wall has its counterpart in metalworking: getting a mandrel out of a fiber glass-laminated part without wrecking the part. This is an almost impossible task if the part has the shape of a sphere, corkscrew or tree.

Impossible, that is, unless you have mandrel materials that will wash out, or melt out in much the same way that mercury does in the frozen-mercury casting process.

Chance Vought Aircraft, Dallas, has been working for some time with two plastic materials that will do just that: Paraplast 33 for use at low temperatures, and Paraplast 55 for high. Both materials, developed by Rezolin Inc of Santa Monica, Calif, will melt out or can be washed out with tap water—and they are reusable if melted out. Both are far more versatile than plaster (which usually has to be knocked out) as mandrel materials.

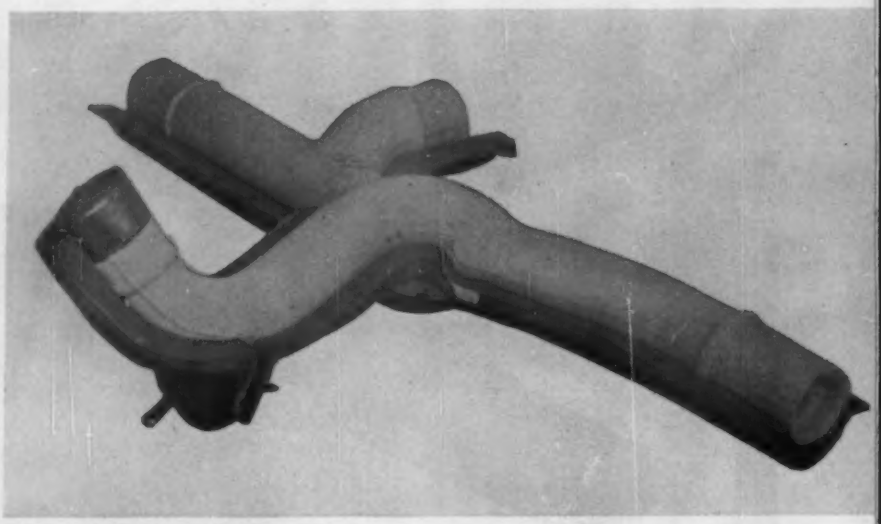
Paraplast mandrels have a low reject rate, because their high strength and toughness make them resistant to bonding pressures. They can be cast to wall thicknesses as thin as 0.100 in., yet still support the pressures of shrink tape, tension wrapping, and vacuum pressures.

Ordinary tap water will remove both materials at a rate of approximately 10 minutes per pound. Hot

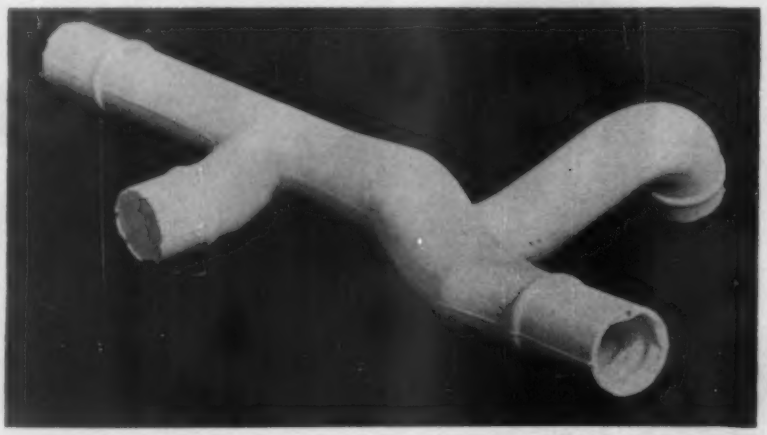
water or steam will do the job even faster (a 1-pound mandrel can be steam-dissolved in 2 to 5 minutes). In still water, the average small mandrel will dissolve in 2 hours. Materials may be melted out, washed out, steamed out or even broken out (only if the part isn't complex). Only the melted-out mandrels may be reused again and again.

Destructible mandrels of this type do have a few disadvantages: (1) they have an extreme affinity for moisture, (2) they are extremely brittle, shatter easily, and require careful handling, and (3) hollow mandrels made from Paraplast 55 are subject to thermal cracking.

However, Chance Vought has found that these plastic mandrel materials are by and large far superior to any other destructible mandrel materials. Even some of their disadvantages may be offset. For instance, shredded fiber glass in 1-inch lengths, added to the molten slurry, will strengthen the mandrel and counteract thermal cracking.



Paraplast mandrel ready for removal from temperature-resistant epoxy mold



Destructible mandrel ready to be used for bonding a fiber glass duct. Mandrel has been placed in an oven for an hour to relieve casting stresses

Making the molds

It is recommended that molds be constructed with only one open end, to prevent material leakage during pouring. The molds themselves must be able to withstand temperatures up to 340 F (for Paraplast 33) for a short period and about 200 F for several hours without warping, gassing, breaking down, or softening excessively. Molds for Paraplast 55 must withstand 540 F for a short time, or 400 F for several hours, also without warping, gassing, breaking, or softening.

Of the many mold materials tested at Chance Vought, the best were found to be aluminum, and heat-resistant epoxy or phenolic laminate. To date, the company has not arbitrarily decided that any of the three materials is superior to the others for all applications. But it can be said that the phenolic laminate cures about six times as fast as the epoxy laminate, and the aluminum test molds don't retain heat as well as do the plastic laminates. The aluminum molds must be preheated again if there is a time lapse of 4 to 6 minutes between castings. These plastic mandrel materials contract when they cool to room temperature, and expand when cured, but the amount is so little (about 0.002 in./in.) that it need not be figured into mold design.

Before casting, the mold should be clean and free from any release agent (actually, no release or parting agent is needed) and preheated to 350-400 F for Paraplast 55, or 150-200 F for Paraplast 33.

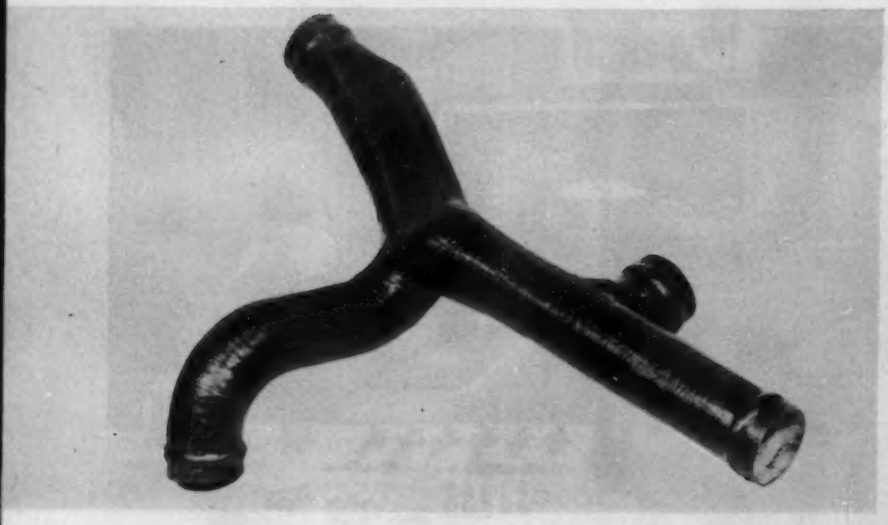
In melting the mandrel material, heater control should be set at 520-540 F for Paraplast 55, or 320-340 F for Paraplast 33. Overheating results in greater thermal contraction, stresses in the cast breakaway, and increased viscosity. Materials should be heated in a clean, dry melter pot, and stirred with a steel or glass rod or a mechanical agitator until completely molten and lump free.

Pouring

Optimum pouring temperature for Paraplast 55 is 520 F, although it may be poured at any temperature between 490 F and 540 F. Paraplast 33's optimum pouring temperature is 330 F, although it can be poured anywhere between 290 F and 340 F. In pouring, the mold should be filled as quickly as possible—the faster the pour, the better the surface. Preheating gives extra smooth surfaces.

After pouring, the filled mold should be allowed to set without slushing anywhere from 1½ to 10 minutes, depending upon desired wall thickness. For example, a solid casting in a 2-inch-diameter duct is usually produced in a set time of 10 minutes, whereas a set time of 1½ minutes will usually produce a ⅛-inch wall thickness. Set time varies for each mold design.

After the mold has set, excess material is poured back into the melter pot, and the mandrel is allowed to cool in the mold for 10 to 15 minutes—unless the mold has beads, con-



Fiber glass part bonded on a Paraplast 55 mandrel, which was later removed by melting, and the residue rinsed out with cold water

voluted sections, or sharp contours. In that case, the mandrel should be removed from the mold immediately.

After removal from the mold, the mandrel is placed in a 200-250 F oven (for Paraplast 55) for one hour to relieve casting stresses. (This does not have to be done with Paraplast 33 mandrels.) Then the Paraplast 55 mandrels are allowed to cool slowly to room temperatures.

If the mandrels aren't used within an hour after removal from the oven (Paraplast 55), or an hour after removal from the mold (Paraplast 33), they should be sprayed with a film-forming parting agent and stored in a dry oven at 160-250 F (Paraplast 55), or at 120-200 F (Paraplast 33). Alternatively, the mandrels can be sealed in cellophane bags.

Laminating and curing

The lamination itself is done by either of two standard procedures: with shrink tape, or by the vacuum bag pressure method.

Maximum safe curing temperature is 450 F for Paraplast 55 or 275 F for Paraplast 33. If a higher curing temperature than 450 F is desired, a collecting container can be placed beneath the laminated mandrel, and the temperature raised to about 540 F to complete the cure. At this temperature the mandrel melts out, can then be reclaimed and reused before the first laminate has completed its cure cycle.

Melt-out and wash-out

After curing, the mandrel may be removed by wash-out, melt-out or break-out.

Wash-out is done after the mandrel is cooled to room temperature, either by placing the mandrel under running tap water, or by soaking it in a container of water. Wash-out may be speeded up by inserting a steam jet in the mandrel orifice.

Melt-out of a laminated mandrel involves placing it on end in a 520-540 F oven (for Paraplast 55) or a 320-350 F oven (for Paraplast 33), and collecting the melt in a container placed beneath the mandrel. If the material has not been contaminated during the meltout, it may be remelted and reused.

Normal break-out methods may be used if the mandrel strtucture permits. Here again the broken-out chunks may be remelted and reused if they are not contaminated.

Incidentally, the melting pot for these plastic materials should be made of aluminum, iron, or (preferably) stainless steel—electrically heated and temperature-controlled to 600 F with an accuracy of ± 10 F. The melter should be equipped with a heated pouring valve mounted on the bottom of the pot.

The melting pot should under no circumstances be cleaned out until it has cooled to below 200 F.

TABLE OF PROPERTIES

for plastics used in destructible mandrels

PROPERTY	PARAPLAST 55	PARAPLAST 33
Form	Powder	Powder
Color	White	Light red
Resin binder content	12% maximum	8% maximum
Water content	1.5% maximum	2% maximum
Heat resistance	450F continuous	275 F continuous
Coefficient of linear thermal expansion	4 x 10-5 in./in. F	4 x 10-5 in./in. F
Water solubility rate (Tap water at 140F)	10-15 minutes/lb	5/10 minutes/lb
Compressive strength	19,000 psi	17,000 psi
Density	138 lb/ft^3	131 lb/ft^3
Specific volume	12.5 cu in./lb	13.2 cu in./lb

Random-access computer contains inventory data on 15,000 parts, including those that go into this fuel-inection pump.

Here American Bosch's S E Miller points out level-by-level storage pattern, from raw materials to finished assemblies.

Automatic memory speeds production scheduling

An automated filing system plus a carefully planned program, lets a Springfield, Mass, plant keep close tabs on its material and inventory status. A single punched card, inserted in the file, activates production scheduling of a product that may contain hundreds of parts. Savings are impressive: Under the new setup, the company already has cut production costs $120,000 a year.

The company is the American Bosch Div of American Bosch Arma, whose 1000 end products contain 15,000 different parts. The file is a random-access data-processing system—a RAMAC 305—made by IBM.

Before scheduling production for any product, the operator "addresses" a punched card to one of many magnetic disks in the RAMAC file (which stores up to 10 million characters of information). The inserted card orders the file to give the inventory status of every material and part that goes into the product.

Once the card takes over, there is no human interference. Within three minutes, the system determines the order's effect on all 15,000 parts that go into the company's products. Purchase requisitions and shop-fabrication orders are prepared automatically.

Because the equipment automatically computes economic-order quantities, the number of shop orders processed each year has already been cut sharply: 4000 of these—each costing $30—have been eliminated. As a by-product of this reduction, machine-setup costs (ranging from $20 to $100 each) will also be reduced considerably.

Other advantages: Standardized production levels will bring about better manpower planning; as a result inventory—not employment—will fluctuate. Production-schedule changes can now be entered into the system immediately. And once a year the system will automate standard cost revisions, reducing expenses for this operation by 70%.

In the random-access computer, product ingredients are arranged in successive levels. Christmas-tree style. At the base are raw materials, and above that are parts made from raw materials, as well as purchased parts. At the next levels are assemblies and subassemblies, and at the top are the finished products.

The computer shows the status of inventory at any level, and warns of shortages by checking the whole tree, down through each material level. When the electronic check reaches the lowest level, the company is warned to order materials.

Besides controlling inventory and managing materials, the system promises to bring other benefits. Working with IBM, American Bosch is expanding the system to include four other basic manufacturing functions: forecasting, scheduling, dispatching, and operations evaluation.

Are we losing an industrial cold war?

America's machinery-building industries must step up productivity if they are to compete with the Soviet Union's mass-production methods.

This warning was spelled out by Professor Seymour Melman of Columbia University at the National Productivity Conference of the American Society of Mechanical Engineers May 18 in Milwaukee.

Professor Melman put on the record much information about Soviet methods contained in his as-yet-unpublished report to the European Productivity Agency, based on visits to three machine tool plants in the Moscow area last summer.

He cited by way of example the Krasni Proletari Factory, which specializes in lathe production. For instance, it turns out a 16-inch standard lathe for general use, and which is capable of some toolroom work, at a rate of one every 15 minutes. About 1000 workers are employed on the line, so that about 200 manhours are required per lathe. (This would indicate that efficiency of the plant's transfer machines, automatic gear lines, and other mass production is on the order of 80%, comparable to U S experience). Another 3000 workers produce special machines.

30 transfer units a month

Moscow's Ordzonikidze Factory, which specializes in transfer machines, is said to be shipping about 20 of them a month, although some are single station.

Sverdlov Factory specializes in horizontal boring, drilling, and milling machines, concentrating its efforts on producing one a day. The plant also produces punched-card control systems for the unit.

Information given by Professor Melman on these plants corresponds with detailed reports on them included in AMERICAN MACHINIST's "Report on Russia" series published November 19, 1956, through May 6, 1957, and with "Automation in Russia" (AM/MM Mar 21 '60 p125).

Incidentally, the standard lathe produced by Krasni Proletari sells in Russia for 14,000 rubles ($3667) and in western Europe for $3800.

Designers and managers of Russian factories make a special point of using as many standard parts as possible in their machines, said Melman, "At the Sverdlov factory, I was advised that about 80% or more of the components in the horizontal boring mill are standard with respect to a range of products made in the factory."

U S machine builders can look for increasing competition from Japan, too. This was pointed up dramatically by the showing of a remarkable Japanese film, "Toshiba in Progress," depicting the advanced production methods, quality of output, and variety of products of the Tokyo-Sibura Co, popularly known as "Toshiba."

"Toshiba," said one viewer, "looks a little like a combination of GE, RCA, and A T & T." At any rate, watching production and research engineers from a number of U S machine tool firms are agreed that Toshiba looks like real competition.

But U S machine tool builders are already taking action to meet competition from Russia, Japan, and other countries. For instance, they are developing machines to make more extensive use of modular (building block) construction, and many U S builders are using numerical control to increase the productivity of their own operations.

Shear forming, free-machining steel test results highlight ASME talks

Highlighting a meeting of ASME's Metals Processing Research Group during ASME's Conference was discussion of a new and simplified method for determining how well a material will work in shear forming.

Developed by Cincinnati Milling's Richard Kegg, the test is made with an ellipsoidal mandrel so that the included angle of the spun cone varies continuously from 180 to 9 degrees. Thus the thickness of the spun shell starts at the original blank thickness, reducing toward zero until fracture occurs.

In this way, it is possible to determine directly what the minimum possible included angle for a given material is—without having to make a special mandrel for trial-and-error testing.

Kegg found close correlation between his experimental results and percent reduction in area in standard tensile tests, but no correlation has been found with elongation.

An approximate measure of limiting reduction of thickness in spinning can be made from the formula:

$$R = \frac{q}{0.17 + \frac{q}{100}}$$

Where q is the tensile-test reduction of area at the fracture (%).

Free-machining steel

Tool life studies of resulphurized and leaded steels at Massachusetts Instiute of Technology have produced some results that disagree with common beliefs, Professor Milton Shaw reported.

In the hot-rolled steels studied, sulphur was found to shorten tool life at certain cutting speeds when the feed was in the vicinity of 0.005 ipr —resulting from development of a built-up edge. Lower feeds eliminated the problem by decreasing chip thickness, while higher feeds solved it by increasing tool temperature.

This suggests that in screw machining with high-speed tools there are critical feed rates that may cause a built-up edge, and that changing the feed either up or down may correct the problems. (Professor Erich Thompson of the University of California reported that he had similar results in another series of tests at 0.005 ipr).

Addition of lead increased the machinability of low-carbon steel about 30% in the hot-rolled condition, and as much as 2% when cold-drawn, but lead was less effective as feed rate was increased.

An optimum tool-chip contact length appears to exist for which tool life will be maximum at a given speed, Shaw said, adding that it is possible to reduce the contact length to a value below this optimum by adding too much lead, too much chip cooling, too much cold work—or a combination of these effects.

Variations in stock left for precision grinding causes small, perceptible variations in the finished work, Shaw concluded. Other random erorrs may occur because of errors in machine repetition. All these random errors, which can be affected by production rate or speed, are imposed on the drift or systematic error resulting from normal wheel wear—making it difficult to correct for drift.

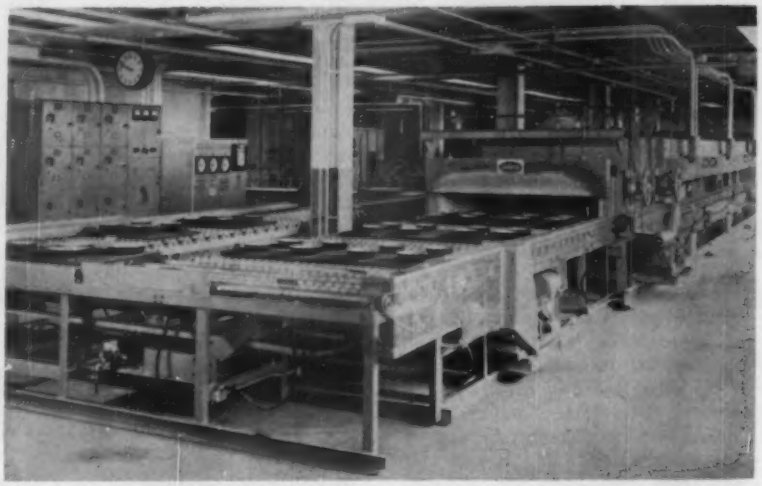
Diversification pays off for Textile Machine

Woman's caprice can throw a well-organized machine builder into a temporary tailspin. Five years ago, Textile Machine Works, at Reading, Pa, got 85% of its sales volume from full-fashioned hosiery knitting machines. When women throughout the world shifted their preference to seamless hose almost overnight, Textile had to scramble.

Today, Textile Machine is "back on top," even though only 15% of its volume now comes from full-fashioned hosiery knitting machines. Employment is up 900 in the past nine months to 3240, 85% of peak postwar employment. Order backlog is triple that of nine months ago, and the outlook is for a 46% gain in sales in the next year.

How could Textile make such a comeback? First, its management was convinced that the skills and equipment of a precision machine shop could be put to work on contract manufacturing. Textile had:

- A shop containing 1200 machine tools with an average age much lower than the national average
- A highly skilled work force with a high proportion of journeymen machinists. Of almost 1000 apprentices trained since 1899, 432 are still employed by the company.
- A gray-iron foundry that is highly mechanized and reported to be the largest under one roof. It turns out work weighing anywhere from a few ounces to 7200 lb.



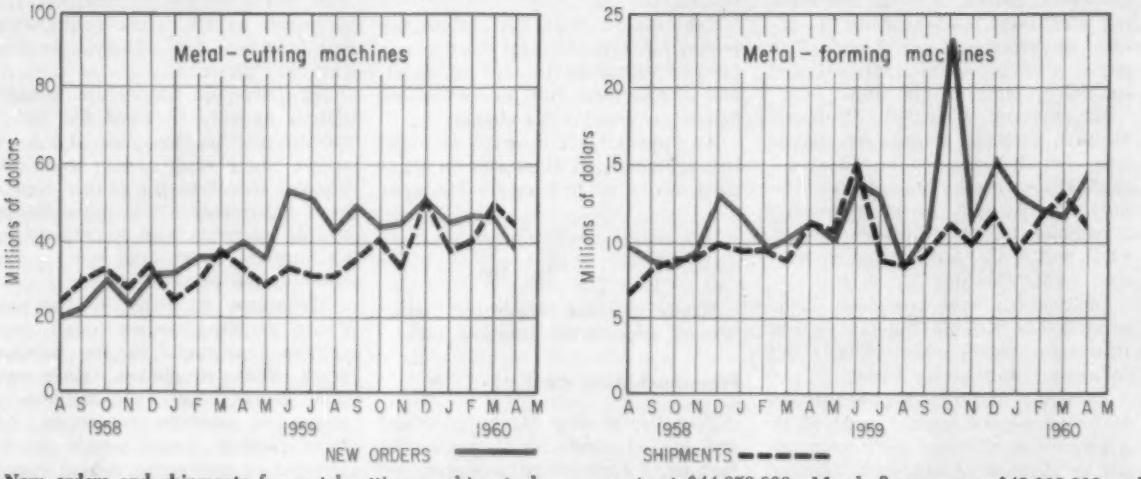
Prizer-Ware porcelain-enameled cast-iron cookware made by Textile competes with foreign-made products because of automation. Spraying of frit, drying while being conveyed through a radiant-heated tunnel, and firing in an electrically heated roller-hearth furnace, all are automatic

These skills and facilities, plus the services of a large engineering group, have enabled Textile to take on subcontracts and prime contracts for a wide variety of products—missile parts, gun parts, machine tools, agricultural machinery, paint-mixing machines, business-machine subassemblies, to mention a few.

Now over 30 customers for the contract division contribute more than 20% of the company's volume.

But in the past five years, diversification has been pushed in other directions too. The firm now makes seamless hosiery machines and circular knitting machines for men's hosiery. And for the first time the company has entered the consumer-goods market by setting up an automated porcelain-enameling line for cast-iron cookware.

NMTBA Index of machine tool new orders and shipments



New orders and shipments for metal-cutting machine tools dropped off quite sharply in April. Metal-forming machine orders rose but shipments dropped. Latest figures from the National Machine Tool Builders Association place net new orders for metal-cutting machine tools at $37,600,000, shipments at $44,350,000. March figures were $49,000,000 and $50,850,000, respectively. Net new orders for metal-forming machine tools in April ran to $14,500,000, shipments to $11,000,000. March figures were $12,000,000 and $13,400,000, respectively

Welding replaced casting and cut costs, but full benefit: of the change came only after an improvement in methods

Machine it before you weld it

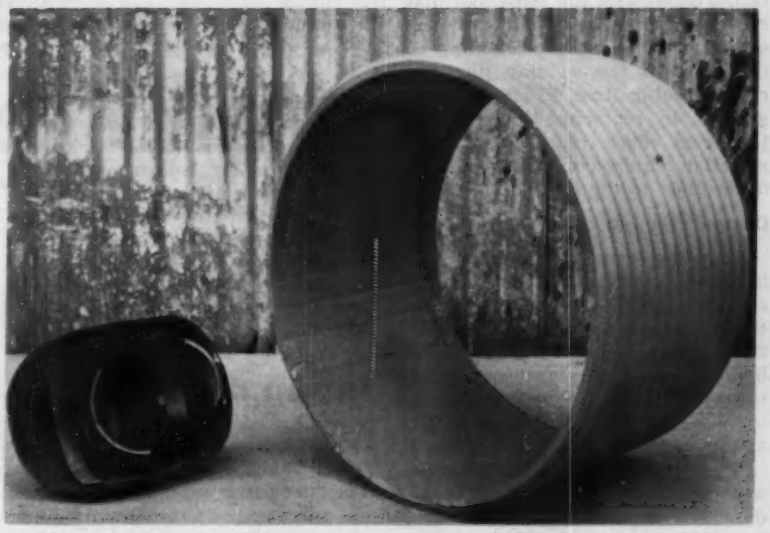
Adapted from Robert A Patterson's prize-winning paper in the 1959 Machine Design Award Program sponsored by the James F Lincoln Arc Welding Foundation. Mr Patterson is a design engineer with Sanford-Day Iron Works, Inc, Knoxville, Tenn.

Welding, a cost saver in itself, can sometimes pave the way for even greater savings in the cost of machining. At least, that's the way it worked out when this hoist drum was changed from a casting to a welded structure.

The hoist, made by Sanford-Day Iron Works, Inc, moves railroad cars at loading and unloading points and also sees extensive service in coal-mining areas. An electric motor, operating through a pair of matched spur reduction gears, drives the drum, which in turn, transmits the power to the rope.

The drum also stores the rope, and in order to guide the first layer properly, it has a helical groove machined across its face. This groove became an important factor in the later cost reductions.

At first, when the company changed to the welded design, the old casting still exerted a strong influence on the manufacturing operations—so strong that the drum was completely assembled before machining. The only exception was the rough-boring operation on the hubs.



Helical groove is machined before assembly, can be cut continuously across drum plate without interference from flanges. Same cutting tool normally machines J-grooves on end faces (not shown here) for welding

Even with this procedure, the new design reduced costs. Fewer machining operations were required, and less material had to be removed by the cutting operations. However, the savings in machine time were not as large as anticipated. Time study pointed to the grooving operation as the major area of potential improvement.

Because of the deep flanges, the operation was requiring a good deal of extra work. For one thing, run-out holes had to be milled at each end of the groove so the grooving tool could complete its cuts without interference.

This meant that, before being grooved, the drum had to be carefully set up so the run-outs could be positioned correctly. One of the run-outs went completely through the

drum plate to provide an opening to the rope clamp.

Even after that, the grooving cut could not be made continuously from one side of the drum to the other. The operator had to start the tool near the center and feed to one flange. Then he turned the drum over and cut to the other flange to complete the scoring. Positioning the tool at the beginning point of each cut was a slow and painstaking part of the job.

The old order changeth

Plant personnel suggested changing the order of operations—machining before welding—to permit grooving the drum continuously from one side to the other. This change also brought about a number of other improvements.

The run-out holes, of course, were eliminated, because the tool could move off the workpiece in either direction. The rope-entrance hole was flame-cut after grooving, so no special procedures were required for putting it in the proper location.

The welding operation was improved, too, by J-grooving the ends of the drum with the same tool that cut the helix. The faced ends permitted more accurate positioning of the parts in the welding jigs and reduced setup time. Further, the J-grooves, by replacing 45° bevels on the drum edges, reduced time and material required to weld the 1-in. drum plate to the flanges.

Design changes, too

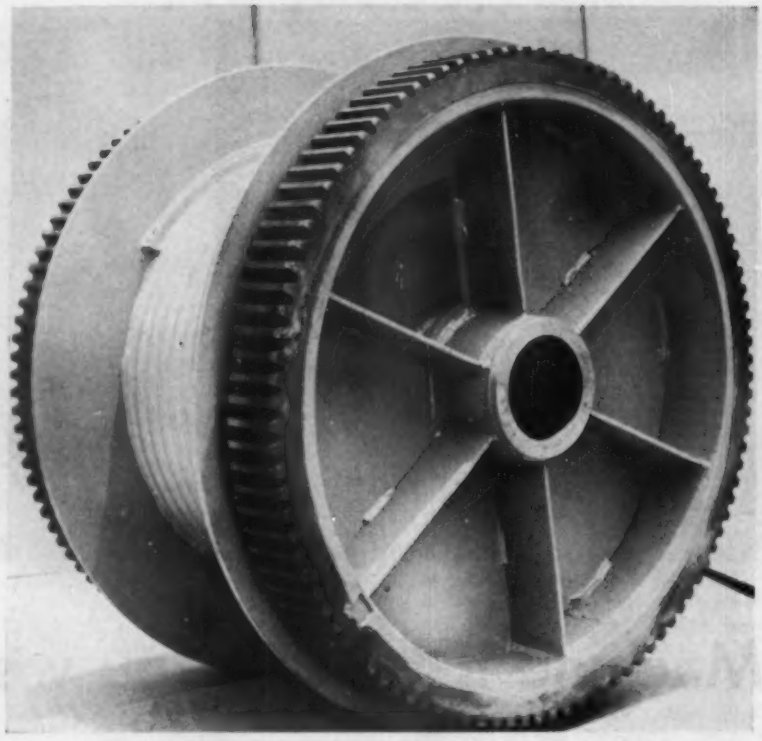
The improvement in methods also led to a further improvement in design. At each side of the drum, there is a ¾-in. shoulder above the drum plate. Tapered to match the helical groove, this shoulder keeps the second layer of rope from crowding down to the first layer and damaging the rope.

When the design was first changed to a welded structure, these shoulders were made of ¾-in. round steel bars. They were welded to the flanges and the drum plate and then machined to a taper to match the helical groove.

In the latest design, the shoulders are tapered before they are installed —by flame-cutting a ¾ x 1¼-in. bar diagonally from one end to the other. The two pieces thus created are formed into unclosed rings and slipped over the drum prior to welding the drum and the flanges. After the drum and flanges are connected, the rings are positioned with respect to the helix and welded into place.

The drum assembly is finished by machining the gear-support rings, finish boring the hubs, and keyseating. All operations are done in one setup except for keyseating.

An analysis of the time required to manufacture the drum assembly before and after these changes shows a very worthwhile cost reduction. Exclusive of the savings made by the original change from a casting to a welded structure, the overall reduction in fabrication, welding, and machining time amounts to approximately 54%. The original design change was made before the time period covered by the Machine Design Award Program and therefore could not be included.



Flame-cutting reduced cost of tapered shoulder in this completed hoist-drum assembly. Shoulder keeps second layer of rope from crowding down to first layer

Japan dominates U S World Trade Fair

Though most of the 4th Annual U S World Trade Fair was devoted to consumer goods, ranging from candy and macaroni to transistor radios, several exhibitors showed machine tools and other metalworking equipment. Leading the way at the New York Coliseum event were the Japanese. Among their exhibits were an electrical discharge boring machine and an electrical discharge band cutting machine made by Koike Sanso Kogyo Co, Ltd, Tokyo; a line of Vibro-Shear plate-cutting and forming machines (similar to the Pullmax line in the U S) made by Toyokoki Seisakusho Co, Ltd, Nagoya; and a full line of milling cutters, reamers, broaches, gear hobs, and twist drills made by Sonoike Tool Mfg Co, Ltd, Nagoya, Japan.

The Japan Machinery and Metals Inspection Institute's exhibit consisted of photos showing inspection of such items as radios, light bulbs, machine tools, and fasteners.

Hindustan Machine Tools Ltd, Bangalore, India, showed a high-speed lathe and a vertical milling machine. Both were developed in conjunction with European builders and are for sale only in India. Hindustan also makes a line of toolroom lathes; vertical, horizontal, and universal milling machines; radial drills, and grinders.

The MG Tool Co, New York City, showed C E Johansson micrometers, Almkvist vernier calipers, and Memo precision blocks.

738 separate gaging operations are required in the manufacture of a single spherical roller bearing. Here a technician checks radius of a bearing raceway. Electronically controlled centerless grinders (background, right) have automatic loaders and in-cycle gaging which controls wheel dressing and compensates for wheel wear

Modernizing boosts bearing output 50%

How far you can carry precision in a mass-production operation depends upon many things—the part you're making, length of run, type of equipment available, and most important, what you mean by precision. Link-Belt Company's new ball and roller bearing plant in Indianapolis is a good example of how modern machines and techniques can put high precision into mass production, and boost production 50%.

Inner and outer bearing rings of less than 8-in. OD are finish-turned from seamless steel tubing on 4- and 6-spindle bar automatics. Larger rings, made from forgings, are finish-turned on copy lathes. The machined parts are then conveyed through a parts washer.

Next step is heat treatment. The inner and outer rings made of high-carbon steel and the rollers are hardened in an atmosphere-controlled furnace at 1500 F, then quenched in oil. To eliminate any size change due to aging, these rings are taken from the quench and put in freezers at –120 F. After the deep freeze, they are washed, then drawn at 380-400 F in an atmosphere-controlled drawing furnace.

It is the next manufacturing step that marks a real advance over earlier techniques. Since the development of the bearing, one of the most critical areas in its manufacture has been a series of manually controlled grinding operations, each followed by gaging as the operator closed in on his tolerance.

In the new plant manual grinding has been eliminated. Electronically controlled centerless grinders equipped with automatic loaders and in-cycle gaging, which controls wheel dressing and compensates for wheel wear, grind the raceways of the inner bearing rings to close tolerances.

The precision ground parts are ultrasonically cleaned and passed through a chilled oil bath. This bath imparts a protective film and also brings part temperature down to the temperature maintained in the final inspection room. Meanwhile, at a separate station, rollers are tumbled to achieve a surface smooth to six millionths of an inch.

In the air-conditioned and dehumidified final inspection area, tolerances of all parts are checked once again and parts are classified dimensionally to insure that each bearing will have proper clearances when assembled. Before it is assembled a bearing will have undergone 758 separate gaging operations, and on some parts tolerances are held to as close as 28 millionths of an inch.

Spherical roller bearings are bench assembled in the sub-assembly area from matched rings and convex rollers. Ball bearings are sub-assembled by an automated machine that measures race diameters, matches race dimensions with the proper ball size, and feeds the required number of balls between the races.

Bearing sub-assemblies are then washed, dipped in preservative, and carried by overhead conveyors to the final assembly area.

Other features of the new plant include its modern materials handling systems and the chip-handling and oil-recovery system. Over 95% of the cutting oil is recovered from the huge quantity of chips produced by the screw machines.

Fatigue growth on a spindle. Two cracks had extended well across the section when it failed suddenly

Black light activates fluoresecent magnetic particles and lights up a fatigue crack on a punchpress crankshaft

Non-destructive parts inspection is common, but have you...

Tested your machines for flaws lately?

By Frank Hausman, punchpress specialist, Employers Mutuals Liability Co of Wisconsin

Called in recently to investigate several punchpress accidents in a single month in one plant, insurance men found that all of them were caused by clutch failure. Not illogically, the investigators pointed out that a little preventive maintenance would have gone a long way toward avoidance of such accidents.

Plant officials weren't at all pleased by the suggestion—"Too expensive and time consuming."

Nothing could be farther from the truth.

Parts, why not machines?

That same plant regularly inspected its products by magnetic-fluorescent, and dye-penetration methods. Yet it had never occurred to management to apply these methods of detecting flaws to the machines that made those products.

Periodic non-destructive testing of such machine trouble spots as oil holes, identification stamp marks, and blemishes would would have pinpointed growing stress areas far in advance of actual breakdown.

Too expensive?

Testing equipment is cheap

Magnetic particle inspection equipment costs less than $200, making it just about the most economical of all engineered inspection methods. Yet it is effective for all ferrous materials. With it, cracks and other surface defects undetectable even with visual magnification can be spotted.

Black or fluorescent magnetic particles, suspended in liquid or in powder form, are brushed on to the part. Prods from a hand-carried electric yoke or coil are placed on either side of the suspected area, creating a magnetic field which causes the particles to collect on the defect and to mark its surface configuration. Under "black light," the magnetized fluorescent particles will show up the tiniest of surface defects, which can then be corrected by grinding and blending the contour.

Too expensive?

Try the dye-penetration method—especially good for occasional inspection of a few parts, or of critical areas on large parts. A kit costs less than $40, can be carried practically anywhere, and can be used on all metals or solid-surface materials.

It works this way: Surface of the part is coated with dye, which is allowed to penetrate any cracks or similar surface defects, and is then wiped off. Penetrant remaining in the defect is then brought to the surface by a developer, showing up the defect as a red line.

The plant which had the punchpress accidents later inspected by

dye penetration such parts as slides, pitmans, pitman screws, keys, locking pawls, clutch pins, and frames.

Too expensive?

Even new parts can be faulty

The plant later instituted a periodic check inspection program for its machines, found defect parts on the presses that hadn't broken down. New replacement parts were spot-checked, too, and even some of these were defective.

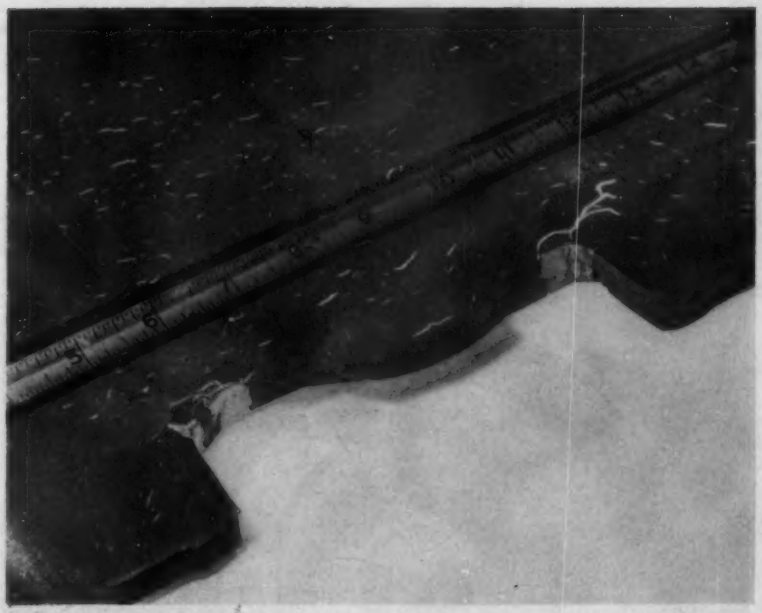
Too time consuming?

Periodic inspection of machines can be scheduled to take advantage of slack periods, vacations, or the like. They're *downtime* consuming, if anything.

Too expensive *and* time consuming?

You can balance cost and time spent in preventive inspection against machine downtime and production interruptions. But it's not so easy to put a price tag on a finger, a hand, or an arm.

Still too expensive?



Magnetic particles indicate the extent and direction of fatigue cracks caused by forging flakes in the metal of this large steel die

Vickers conference updates hydraulic practices

Three ways to improve pump life with water-base and fire-resistant hydraulic fluids — which normally wear pumps more than petroleum oils—are:

1. Maintain the system temperature at 115 F.

2. Remove dirt with inexpensive magnetic plugs.

3. Use clean oil.

This procedure has recently increased pump life to about 9000 hours—as against 14,000 hours for hydraulic oils under the same conditions.

Fire-resistant fluids was one of a number of subjects under discussion at the fourth annual Production Machine Tool Hydraulic Conference, sponsored by Machinery Hydraulics Div, Vickers, Inc, in Detroit last week.

NMTBA president Allan C Mattison keynoted the two-day meeting by pointing out that only technological advances are holding the market for machine-tool builders against foreign competition. His recommendation: "Continue with improved design, increase productivity, and stabilize wages so these advances can be reflected in lower machine prices."

Other developments covered at the meeting included:

- Valves for service at 3000 psi are now available, and the market for 5000-psi valves is being studied. New from Vickers is a valve with built-in bleeding and adjustment for deceleration control.
- Flexible hose on machine tools with low-pressure systems reduces fluid losses from shock and vibration. A Gleason Works representative showed a single-wire braided hose that meets JIC standards. Hose eliminates pipe threads and allows freer slide motion.
- Preventive hydraulic maintenance at Chevrolet's Buffalo division, described by F E Fiedelr, is controlled by machine records, control cards, and time records to eliminate hit-or-miss repairs.
- Numerical control systems described included a DeVlieg horizontal Jig Mil with accuracy to ±0.0005 in. anywhere on the table, controlled by linear actuators. Another was a Burgmaster machine with a Vickers power pack that eliminates leadscrews; a third was an N/C Bullard Man-Au-Trol with linear transducers and hydraulic positioning power pack.
- Comparing electric vs hydraulic drives, it was agreed that the two systems are comparable in respect to power available, but that hydraulic systems have advantages for weight, size, speed range, and response.
- Three methods to keep temperatures low, pointed out by R J Render of Vickers, are use a standard air or water cooler, use a pressure-compensated pump which operates only to keep up a preset pressure, and an unloading system that provides only the required flow.
- New adjustable-speed hydraulic spindle drive for contour millers was described by B Welse, Technical Director, Colonial-Romulus Div, Colonial Broach & Machine Co. A variable-speed motor and single pump vary speed and torque with the diameter of the cutter to approach constant power.
- Vickers showed off two "building block" servo systems made up with standard components. One was a velocity system accurate to ±2 rpm, controlled by tachometer-generator feedback; the other a positional system for repeat accuracy to ±0.001 in. Both are closed systems capable of control by tape or punched cards.

Coolants for carbide-tool grinding

By David C Kauffman,
Crescent Cutter Co, Carlstadt, N J

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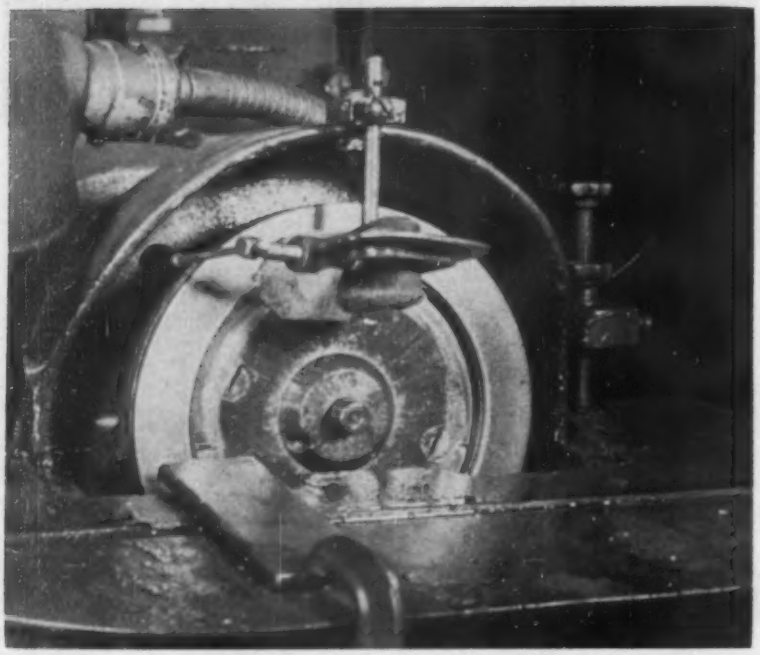
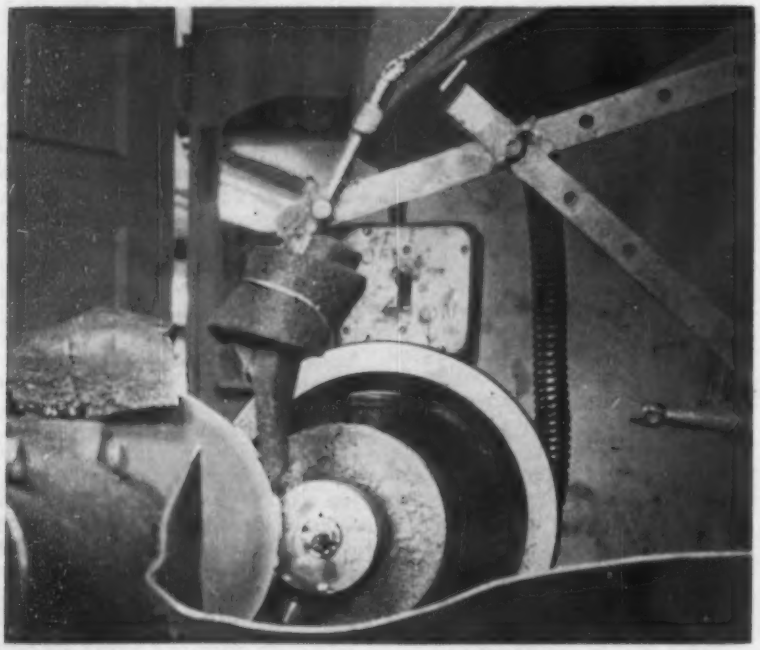


Wick feed on an offhand grinder is simplicity itself. Removable rod forms a bracket to which felt wick is clamped. Wick touches wheel in position to feed coolant to tool-contact point on wheel



Carbide tool is diamond-ground (Note converted milling-machine base). Wick feeds coolant to surface of diamond wheel; line feeds oil from reservoir above

What's the matter with coolants for diamond-wheel tool grinding? Is there some deep, dark reason why they won't work? Must diamond wheels—which cost as much as several hundred dollars each—operate dry?

According to several leading diamond-wheel manufacturers, coolants can reduce wheel consumption by two thirds. They also can improve work finish and increase stock-removal rates. If there are production and economic advantages, what are the disadvantages that seem to be so powerful?

Admittedly there are a number of real problems, and some of them are human, not technical. But they can all be overcome if the shop can pick a good coolant for its particular job, then learn how to apply the coolant properly.

Management is often not aware that coolants for tool grinding can make a real difference in results. Foremen and lower management often ignore this area of cost reduction because they know that coolants may become a labor problem. Coolants are plainly not convenient or desirable from the point of view of the operator.

Odor

Grinding-oil odor is the most common objection—strictly a human reaction because odor obviously has no effect on the work produced. The odor saturates the area around the machine, and it gets into the operator's hair and clothing. It makes a mess that cannot be avoided (with coolant applied in a conventional way) if the operator must constantly check his work at the machine. But there are odorless grinding oils on the market—you just have to look for them. Check for odor by rubbing some between your hands (to warm it) then holding your hands close to your face. You should detect no odor, and your eyes should not smart.

Smoking

When there is too much pressure between the wheel and the work, there will be friction and heat—which makes many conventional cutting oils smoke. This can be mini-

. . . they DO make sense

mized by several methods. One is to choose an oil that will not smoke, providing it also does a cooling job. Another is to apply coolant in sufficient quantity to remove heat from the grinding area, which will prevent heat buildup. Third, use grinding procedures that will not develop heat—no excessive feed or depth of cut, both of which raise the wheel pressure.

Smoke is an indicator of excess heat, which may damage the wheel and should always be avoided. Any diamond wheel has a practical limit to the depth of cut or feed rate it can handle—mainly determined by the grit size of the diamond particles. If you go over these limits, you are almost bound to produce heat—and smoke.

It may be true that dry grinding produces no smoke, but dry grinding means hot grinding that can ruin the wheel and produce a cloud of diamond dust that wastes away a costly wheel. The best way to keep diamond costs down is to keep the diamonds in the wheel, where they can work for you. Therefore, heat should be avoided.

Economy

The most important technical factor is cost. Will the coolant cost more than it can save in increased production and lower wheel wear? Some exotic cutting oils that do a good job are much too expensive. A diamond wheel that works seven hours a day with coolant applied by felt wick will need two to three quarts of coolant/day. You can't starve a grinding wheel for coolant, just to save coolant cost, because this will prevent the coolant from doing its necessary job. For average savings in time and cost, it is reasonable to spend from $4 to $4.50 per gallon for coolant.

Heat absorption

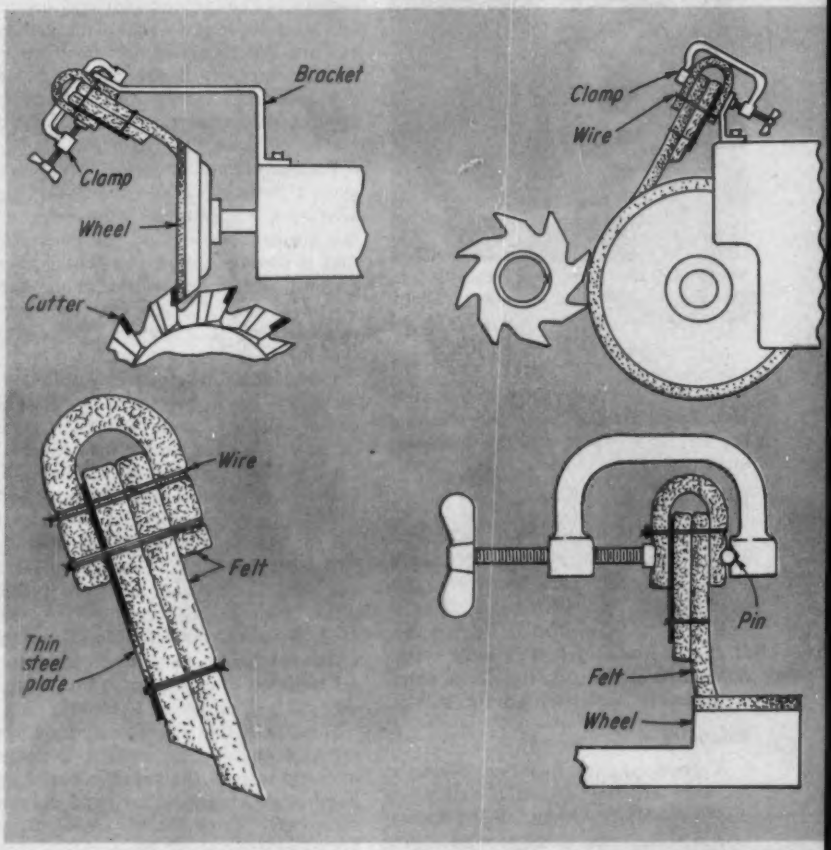
The cooling ability of the oil should be checked, if possible. Water-base emulsions have high cooling capacity because of the high proportion of water included. Most oils have lower heat-absorption rates, but there is a remarkable difference in cooling ability among cutting oils.

Oil vs water

Undiluted oil naturally costs more than a 30:1 or 60:1 water-base emulsion, but results with an oil are often measurably better. Cooling action with a water-base liquid may be too good—the water has a tendency to quench hot carbide, which may damage the wheel bond and produce cracks in the carbide.

Water will not lubricate the space between the diamond wheel and the carbide. In addition, a water-base coolant may tend to gum up and clog up the wick applicator. You can see the difference during a grinding cycle, where an oil tends to keep the wheel cleaner and freer cutting because it penetrates and cleans the face of the wheel.

In years of grinding and testing carbide we have never been able to get a scientific explanation of the fact, but we find that tool edges ground with an oil coolant are measurably better than those done with a water-base coolant. Examination under a 20X scope shows greater sharpness and smoothness. Finish on the carbide is finer.



Felt wick can be clamped to any kind of holder. Notches are to prevent slip; spring steel plate to provide stiffness. Wire is to hold assembly together.

Perhaps it is partly due to the detergent action of grinding oil, which makes the oil wet better, take on heat better, and cushion the shock of the wheel on the cutting edge.

Clean wheels

It is most important to keep the wheel clean while it is working. The wheel cuts faster, the diamonds are exposed better, pressure is lower, heat buildup is lower, the work sparks out faster, sizes are easier to hold, and finish is improved.

It is something of a novelty for an experienced machinist to see how clean a wheel can be when grinding carbide if oil is applied. Usually the wheel is covered with sludge, even if air mist is applied.

If a tool is covered with sludge after being ground, it may be hard to clean and examine. But if the grinding oil is soluble in water, the tool can be swished around in water for a few seconds to remove all

Something like 50% of all carbide tool grinding with coolant is done on setups similar to this one

traces of oil and sludge. A water-soluble oil is also easier on clothing and fixtures as it can be removed with water.

Fire Hazard

A good way to check for flash point in the cutting oil is to put some in a jar lid, light a match, then place the match in the oil with the unburned end resting on the edge of the lid. If the entire match will burn without igniting the oil, the flash point is probably high enough for safety.

Viscosity

A good coolant has low viscosity for two reasons. First, it improves wetting action, which means better cooling. Second, it improves capillary action as the oil feeds through the wick applicator. But a coolant should not have excessive volatile solvents because they will evaporate and leave gummy residue on the wheel and wick.

Acidity

Ph for the coolant should be as close to 7 as possible—neither acid or alkaline. A resinoid wheel bond will be affected by either acidity or alkalinity, and you might lose diamond grit too rapidly.

Rustproofing

It is also desirable to have rustproofing qualities in the oil. This can be checked by dipping test pieces of steel in two or more coolants and running exposure tests. The samples should be liquid honed or smoothed with dry emery paper before dipping and testing.

Here's the method

From the above qualifications, you can see that it is important to apply the coolant the right way—there are so many elements that can go wrong and ruin your results.

For 90% of all carbide-tool grinding, wick application of coolant is the most effective and practical method. Most toolroom and cutter grinders are not designed for flood cooling; in fact, most are designed for dry grinding. Unless the coolant is applied effectively, it is a complete waste of time and effort.

Air mist is not usually effective for several reasons. It is usually expensive and wasteful, it often pollutes the atmosphere around the machine, and it usually requires a water-base coolant, which will not clean the wheel as will oil. Among other disadvantages, it provides too little coolant.

Oil-wick cooling can be applied to all kinds of tool grinders—offhand, cutter, surface, and OD. Each type of machine can easily be adapted for wick coolant application at low cost and with minimum trouble.

There are two ways to meter the oil to the wick. One is to saturate the wick from an oil drip cup, and the other is to install a bulky felt wick and add coolant as required from a squeeze bottle. A saturated wick can hold enough coolant for 4-5 minutes of grinding, so this method isn't as tedious as it sounds.

The wick can be mounted on an offhand grinder by bolting a piece of strap iron to the grinder guard or hood, then clamping the wick to the strap so it touches the wheel. This arrangement should be demountable so the wick can be swung aside when tools are not being ground.

If the offhand grinder has a water pump, there is usually a small copper tube leading down from the tank to the center of the wheel. A piece of felt can be wired or clamped to the end of the tube, then the water-soluble compound in the tank replaced by oil. Finally, move the support so the wick touches the inner edge of the grinding wheel so oil will flow uniformly to the actual spot on the wheel where the tool is being ground.

Wickholders can be improvised in similar ways for surface and OD grinders. If the wick must be curved to reach an oddly located wheel, you can wrap the outside of the wick with 1/16-in. iron wire, then bend the wick into place.

Most wheel wear in form grinding takes place when the tools are being roughed. The wick and coolant may seem to hinder operations, but the advantages in reduced wheel wear will far outweigh this minor difficulty. Before final grind, the tool should be wiped clean or rinsed, then finish-ground dry.

It is often difficult and awkward to grind milling cutters on a cutter grinder, and a wick may seem like just one more complication. But the savings in costly diamond-wheel wear can really add up, and the wick isn't really that much trouble if the operator has an open mind about coolants. Tools such as reamers, counterbores, end mills, flat form tools, and so on, can all be ground with coolant from a wick. All will end up with sharper edges, longer life between grinds, and therefore less frequent grinding.

Equipment

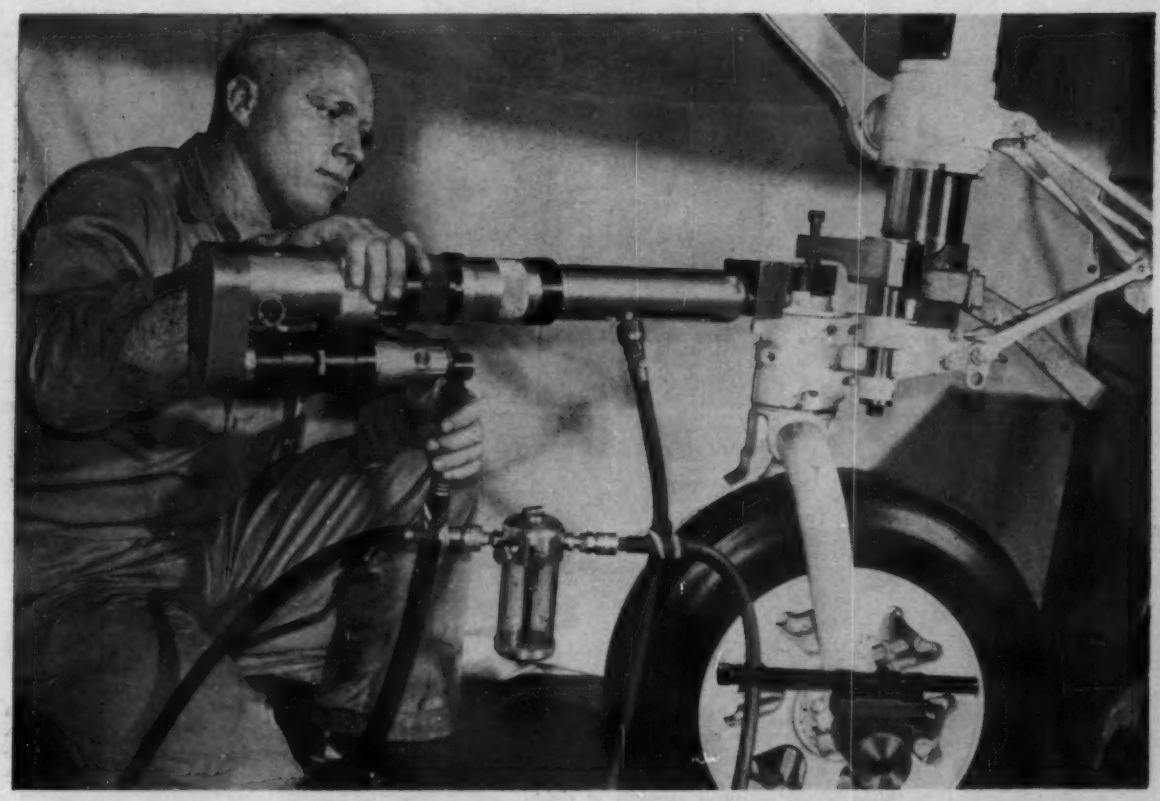
Wicks should be hard, stiff felt about ⅜ in. thick made from flat sheet or round lengths. Round felt is usually fitted to an OD wheel, and may be wire-wrapped for extra stiffness. The felt must always be in contact with the diamond wheel and always under light pressure against the wheel.

Wicks should also be attached in such a way that the operator can easily move them aside in order to see the work without getting sprayed, and to remove the wheel from the machine without interference. Often a wheel guard will be necessary to prevent excess spray, but this can be made up from sheet aluminum, bolted or clamped into place so it can be quickly removed when necessary.

Results

Do coolants really improve results? In our own shop we have adopted an oil (not a standard cutting oil) that has all the desirable properties mentioned above. We know for a fact that some of our wheels are giving us at least 200% more life than when dry. The tools are being ground sharper and to a finer finish.

Here's a specific example: On one edge-grinding operation in our shop (on router bits), a 3¾-in. 60° cup wheel has ground over 15,000 tools, removing at least 0.004 in. of carbide in passes of approximately 0.0008 in. per pass. The resinoid wheel has a 320-grit diamond cutting section ⅜ x 1/16 in. Tool edges come out at 2-3 micro-in. and are razor sharp. We couldn't possibly achieve this grinding life or finish with any coolant other than an oil with the properties described. A number of wheel manufacturers have tried the same setups and verified our results. How our machine operators would be shocked if we tried to take away the coolant!



Have gun drill . . . will travel

Bringing a gun drill to the work is something like the mountain moving to Mohammed. For years, shop men have looked upon a gun drill as an immovable object—a delicate, expensive machine that stays put. In other words, if you wanted to gun drill a piece, no matter how big or hard to handle, you moved it to the gun drill.

But now, Douglas Aircraft has pulled a real switch on this time-honored practice, and it's paying off handsomely. At its Torrance, Calif, facility, Douglas is now gun drilling with portable tools. Not only does this greatly simplify aircraft assembly, it is a technique that can be used in subassembly work, and even for servicing aircraft in the field.

Stationary gun drills more often than not are reserved for accurate drilling of deep holes with high length-to-diameter ratios. Douglas's portable gun drills, on the other hand, are primarily for producing relatively short holes that must be straight and true. These are quickly and economically gun drilled to size within ± 0.0005 inches.

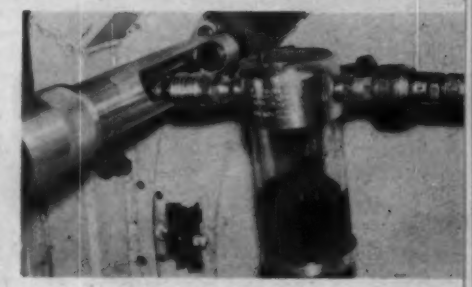
The portable drills eliminate handling, locating, drilling and reaming of large, bulky parts which must later be positioned and assembled—and holes are now produced in components of an assembly when they are needed, not before.

Standard Quackenbush portable units equipped with Keller bushing locks and air-fluid chucks, drive the National Target gun drills.

Feeds are positive at 0.0005 to 0.001 ipr, and because the drill is mechanically advanced, there is no surge when it goes through laminates, or when differences in hardness are encountered. Burrs at breakthrough are virtually non-existent. Retraction of the drill is automatic at the end of a preset stroke, or the drill may be retracted manually at any time. Coolants are applied as mist or oil to flush chips away.

Because it has a carbide cutting edge operating in a confined space filled with cutting oil, the gun drill can machine difficult materials, which ordinarily can't be handled successfully with conventional drills.

Douglas is drilling such materials as 4340 alloy steel heat treated to 180,000 to 200,000 psi tensile strength, and other steels heat treated to 260,000-280,000 psi. Another material gun drilled at Douglas has a core of 240,000 psi tensile strength, with a case-hardened skin 1/32 in. deep.



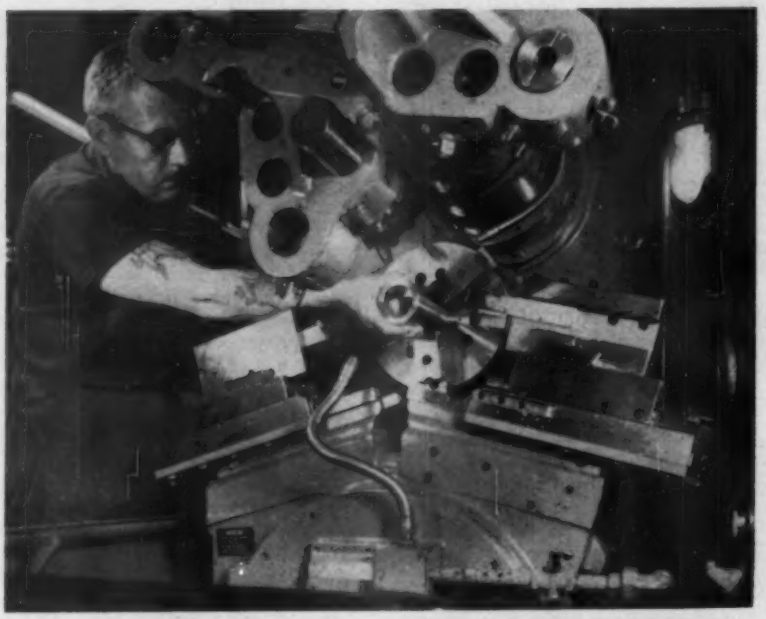
A series of holes is drilled in aircraft components with this portable setup. As in conventional gun drilling, a good supply of cutting oil is provided under pressure to keep chip formation free, to remove chips, to remove heat from the cutting edge, and to reduce tool wear

Before drilling begins, the Quackenbush unit is slipped under two headed screws on a fixture, is twisted and locked in place. The Keller bushing lock holds the Quackenbush assembly rigidly to a simple fixture attached to the work—so that no misalignment or wobble can occur during the operation. The drill is usually advanced to a predetermined depth, then retracted automatically.

SHOP SHOTS

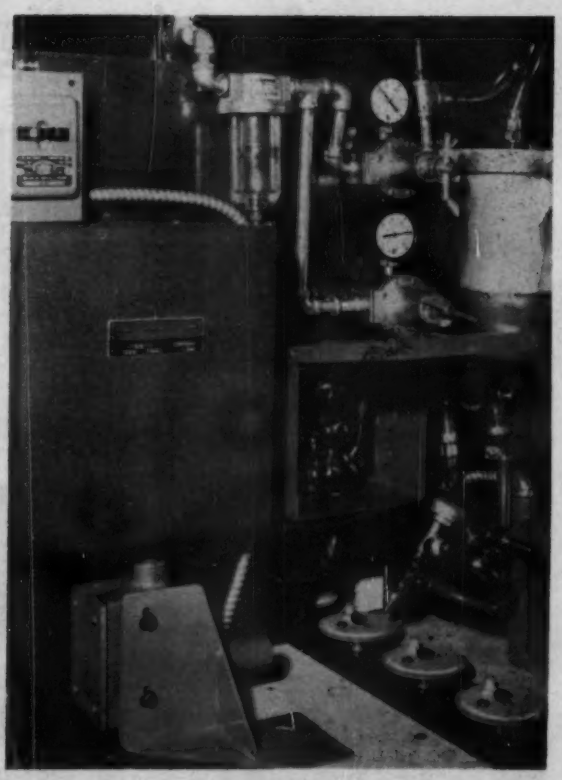
Assembly at a drill
A dial and knob for an electric potentiometer are pressed together and held by an air cylinder at a Burgmaster 6-spindle turret drillpress while the setscrew hole is drilled and tapped. The setscrew is added by hand, then the third spindle runs it into the hole. Remaining three spindles repeat on the next assembly. Air fixture is controlled by lever at right

Frozen soap braces honeycomb
A new 10-in. cutter with carbide edges slices stainless-steel honeycomb at Rohr Aircraft Corp. Large-diameter cutter is a Kennametal K92 carbide ring clamped on a steel disk, both rotating at 3600 rpm. Water and soap are frozen inside honeycomb structure to provide rigidity, prevent burrs. Soap in solution improves slipperiness to reduce wear on tool

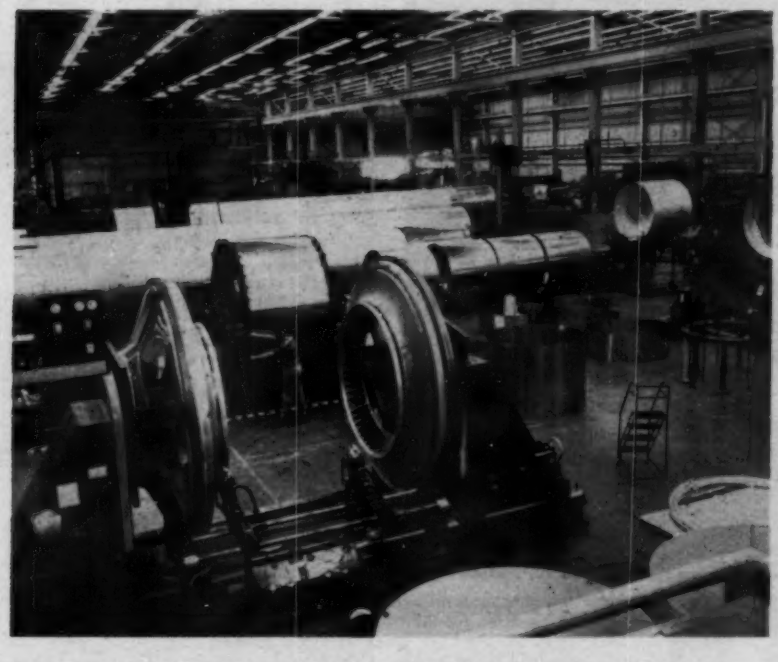


Slugging justifies small lots
Tool-steel casings and die shells are turned and bored complete on a Warner & Swasey 2AC in lots of 15 to 30 pieces, and even as few as two pieces economically. The H-12 tubing is bandsawed to length, then machined by HSS and carbide single-point tools with the simplest possible setup. Diameters range from 1⅜ to 8 in. Production rates are as much as six times as fast as on engine lathes, according to Lamson & Sessions, Cleveland

Powered fixture mills atomic core
Stainless-steel core baffle for Westinghouse Yankee power reactor is machined at R H Freitag div, Alloy Mfg Corp, Akron, Ohio, by special fixture. Giddings & Lewis milling machine supports the work, but cutting is done from a gibbed box section mounted through the core. Motor-powered milling head traverses the box section by rack and pinion. Accuracy on the interior surfaces is to 0.001 in. with HSS tools



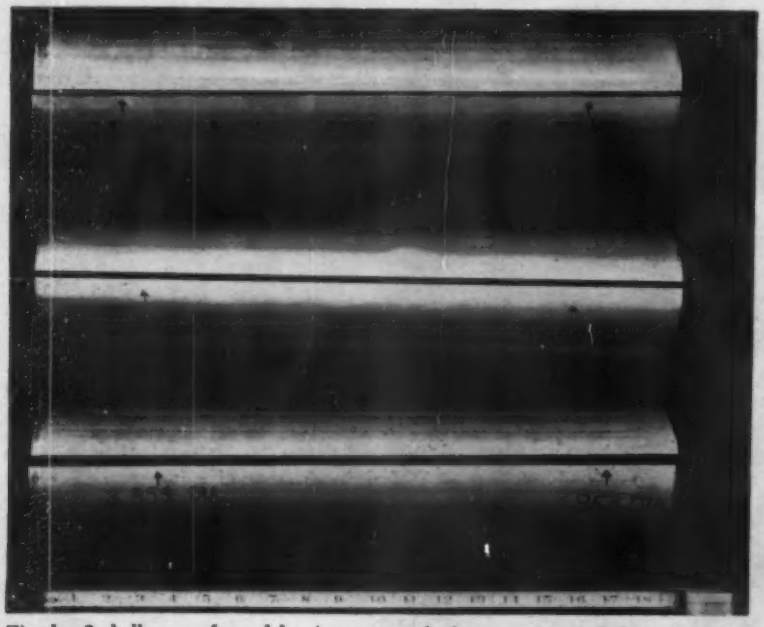
Timer speeds up automatic soldering
Small parts can be joined with paste solder at high speed —up to 8400 per hour—on equipment recently improved by Fusion Engineering, Cleveland. Solder is injected to the assemblies by a nozzle (to right of ceramic fixtures on belt). Driving force is an air system with fast recovery rate in cylinders and regulators. Control is by electric eye (left of belt) and sequence timer



Circumferential welder for Saturn skins
Opened-up welding fixture takes 105-in.-diameter aluminum skins for LOX and fuel tanks for interplanetary space vehicle. Sections are of Alcoa 5456 welded together on the oversize lathe to make up 60-ft-long tanks (in rear) at Redstone Arsenal by Rocketdyne div, North American Aviation, Inc.

Good forming and welding procedures

Weld positioner holds work securely while hold-down fingers and back-up mandrel provide heat shunt. Small trailing shield shown here limited the welding speeds, so it was replaced with a 5-in. trailing shield



Zircaloy-2 shells were formed by 4-step press brake operation and then slit milled to the close dimensions required for special tubes—3.855 ±0.005 in. dia

By **Harlan Meredith**, vice president, Airline Welding and Engineering, Hawthorne, Calif

Once the mystery is removed—once a procedure is established—there's nothing extremely difficult about welding Zircaloy-2. True, it does require special handling in some respects, but so do most other metals, especially the new, exotic ones.

The important thing is to find out the particular requirements for each metal. However, that's where the trouble usually begins with Zircaloy and the other Space Age metals.

For these, the supply of welding information and experience is very limited, and much of it is confined to the laboratory. Therefore, it takes a good deal of experimental work to develop the techniques for welding these materials on a production basis.

Because of this situation, a testing and experimental service has been added to Airline Welding and Engineering's activities. In addition to making precision welding equipment and related machinery, we are now developing production welding techniques for both the metal producers and the metal fabricators.

One project, undertaken for General Electric Co, was to establish the methods for making precision tubing out of Zircaloy-2:

Length: 18 ±½ in.
Thickness: 0.154 in.
Mean OD: 3.870 ±0.005 in.
Max Bow: 0.010 in. tir in 18 in.

No surface blemishes of any description were allowed.

Even in the more common materials, this would be an exacting set of specifications. In Zircaloy, it meant we had to start almost from scratch, but here is the procedure we finally developed.

How the tubes were made

First, we square-sheared the blanks to 11.830 x 18.000 in., allowing stock for edge preparation. Earlier attempts to shear Zircaloy-2 in this thickness had proved that we had to machine the edges to avoid micro-cracks.

Next, we formed the prepared blanks into tubes with a 225-ton Chicago-Dreis press brake. After bumping the joint edges to form a lazy U shape, we rough-formed the piece to a nearly closed oval with the help of an open-window, round-

make precision Zircaloy tubes

Table I—Procedure for Tig welding Zircaloy-2

Material condition	annealed
Thickness	0.154 in.
Joint Type	square butt—one pass
Joint preparation	machine and aqua hone
Cleaning method	acetone degrease
Welding current	270 amp, DCSP
Welding voltage	18 v
Travel speed	17 ipm
Inert gas (in torch, trailing shield, and back-up	40 cfh helium plus 15 cfh argon
Electrode	1/8 in. pure W

Table II—Test Results—Annealed Zircaloy-2, 0.154-in. thick

	Base Metal	As-welded	Planished Welds
Ultimate tensile strength (psi)	73,469	75,181	75,113
Yield point (psi)	50,517	53,824	55,295
% elongation in 2 in.	30.2	22.0	20.9
% elongation in 1 in.	—	6.0	4.2
Minimum 105° bend radius (in.)	3/8	—	—
Face	—	3/8	5/8
Root	—	1/2	3/8
% elongation across bend in 2 in.	6.0	—	—
Face	—	6.0	6.0
Root	—	6.0	5.6
Fracture location	—	Base mtl	Base mtl

bar ram and V-groove die.

Then, to form the oval into a round tube, we used a special guillotine-type female closing die and ram. This type of forming compresses the rough-formed tube to a smaller diameter, upsetting the fiber stresses and exceeding the yield point to cause permanent setting of the tube walls while under restraint.

To do so, it compresses one edge past the other about one peripheral inch. Then, when the ram is raised, the overly bent edge springs back, leaving a joint gap of ¼ in. when bending on a 1.775-in. full radius. Springback is on the order of 45°.

We found that it took several blows to form the tube to the shape we wanted. During the forming operations, the Zircaloy-2 behaved in a manner similar to type 304 stainless (¼ hard condition), except for toughness and springback.

Prior to welding, we machined both joint edges square and aqua honed the edges and adjacent surfaces. Then we degreased the entire tube before inserting it in an Airline welding positioner (Model LW10011).

This longitudinal positioner has two parallel banks of segmented fingers that hold the work firmly against a back-up mandrel, providing, not only secure positioning, but also a highly effective heat shunt. The mandrels are interchangeable and are fitted longitudinally with a replaceable copper back-up bar.

For the Zircaloy tubing, we employed a solid 3-in.-dia mandrel and a special copper insert with a modified drop-through groove machined down the center (see sketch). Small orifices staggered off center of the groove dispersed inert gas to the weld-root area.

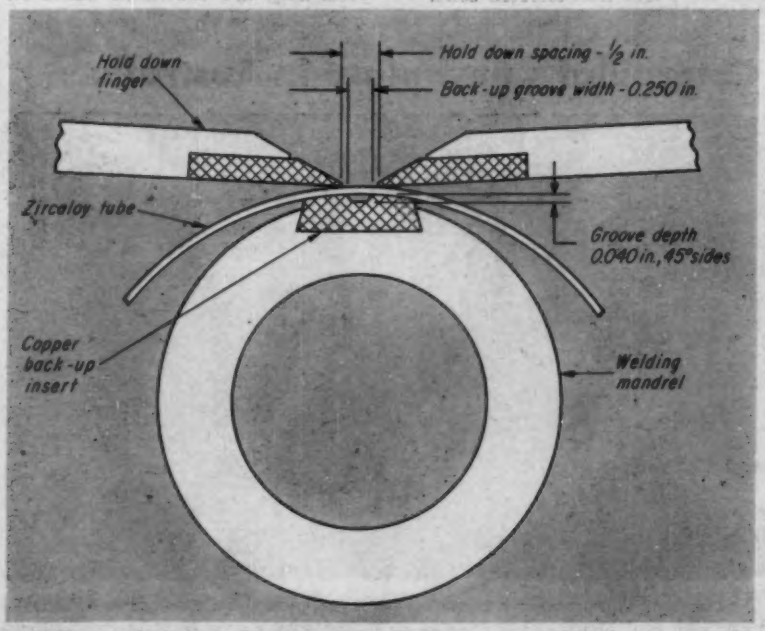
When we were ready to install the formed tube in the positioner, we simply disengaged one end of the mandrel and slipped the tube into position lengthwise. Then we clamped it between the hold-down fingers and the back-up bar with the joint edges butted together over the center of the groove. Hold-down pressure was 35 psi.

We made all our test welds and the welds on the tubing itself with the Tig process (tungsten-arc, inert-gas) without filler-metal additions. The welding torch, carrying a ⅛-in.-dia pure tungsten electrode and a Noox trailing shield, was supported by a precision track and carriage to maintain a constant arc length.

During the experimental phase of the project, we found that a mixture of helium and argon worked better than argon alone as a shielding gas. The test welds made with a 100% argon shield had undesirable porosity in the weld zone, possibly because of minute amounts of contaminants such as water and nitrogen in the argon.

Therefore, we switched to the mixtures. Actually, we mixed our own with an Airline flowmeter station (Model 605-3), but we stayed as close as possible to the non-priority, commercial mixtures.

The correct ratio is an important factor in welding Zircaloy-2. The flow of helium should be far great-


Hold down finger
Hold down spacing - ½ in.
Back-up groove width - 0.250 in.
Zircaloy tube
Groove depth 0.040 in., 45° sides
Copper back-up insert
Welding mandrel

Chill-shunt tooling draws heat away from weld area. Special back-up groove for 0.154-in. Zircaloy-2 is machined to desired contour of weld root

er than that of argon—73% to 27% worked best for welding the 0.154-in. material.

Closely related to this factor is the proper *application* of the inert-gas shielding. It must prevent air from reaching the weld root, molten weld puddle, heat-affected zone, and all areas of the weldment that are heated above 700 F.

Therefore, the trailing shield must be properly designed. In fact, the length of this shield is the principal limitation on the rate of arc travel.

If gas flow is adequate but the shield is only 3 in. long, welding speed must be relatively slow—on the order of 10 to 15 ipm. If the shield is 5 in. long, arc travel may be increased to 15 to 20 ipm.

After purging the air in the hoses, torch, and back-up groove for 8 to 10 sec, we welded the Zircaloy-2 tubing with the procedure outlined in Table I. The helium-argon mixture (73:27) completely prevented porosity and eliminated oxidation of the root drop-through. Furthermore, the radiographic films showed perfect "water-white" clear weldments.

Avoid rough material

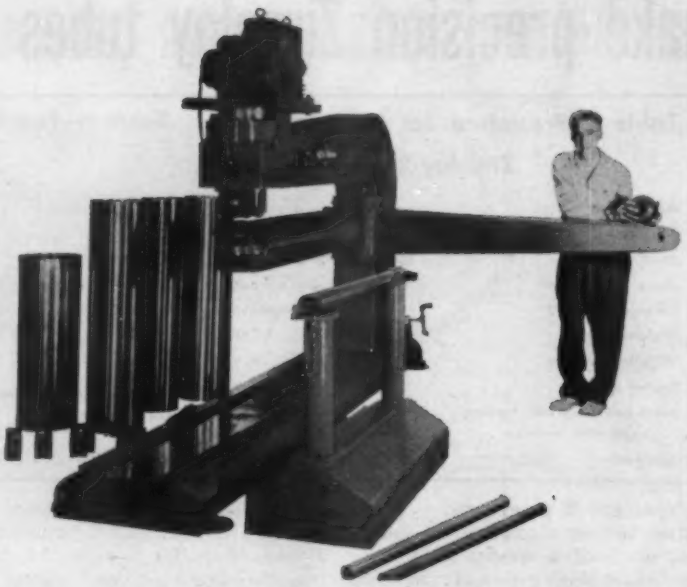
One problem did arise from the fact that the surface of the Zircaloy-2 as supplied was exceptionally rough. Because of this, the hold-down fingers could contact only about 50% of the surface.

As a result, the valuable chill-shunt effect of the mandrel and fingers was reduced, and some areas adjacent to the weld became overheated. This caused some peripheral oxidation, but we were able to remove the surface contamination by power brushing.

Nevertheless, we found during the test program that we obtained our best results when the chill-shunt tooling was able to operate as it should, conducting heat away from the molten weld puddle at all times. We also found that the amount of welding mass exposed to the arc should be as small as possible to produce the smallest possible weld.

The final step in processing the tubes was to roll-planish the weld seam and heat-affected zone. One of the purposes of planishing is to relieve internal stresses by cold working. Another purpose is to "iron out" the weld profile so it has a uniform thickness equal to the base metal.

When the weld is fed between two contoured, hardened rolls—or between a roll and a back-up mandrel—a high squeeze pressure forces the drop-through back into the body of the weld. At the same time, it eliminates the face concavity common to butt welding without filler metal.

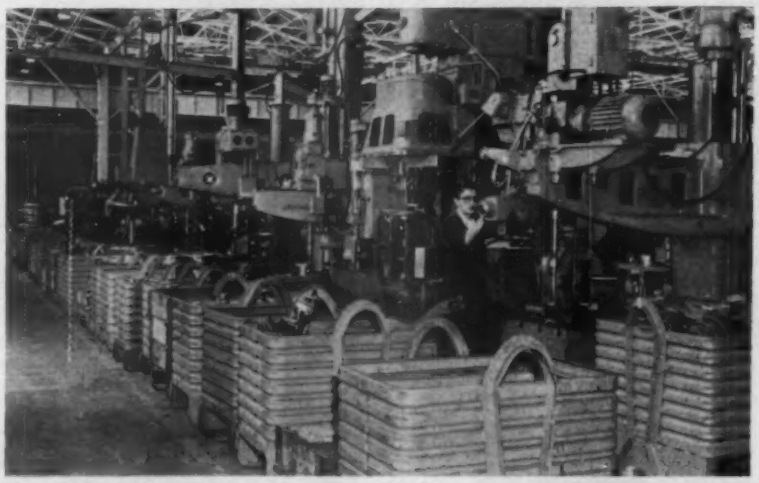


Planisher "irons out" the weld and relieves internal stresses by cold working. Several arbors handle wide range of work. For 3.870-in. tubing, the truck-mounted arbor was placed on base of planisher and traversed under concave upper roller

To planish a tube, we placed it over a small, 3-in.-OD arbor attached to a traversing truck on an Airline planishing machine (Model R44572). Then we applied a force of 23,000 lb through an upper, concave roller and made six lengthwise passes over the weld and heat-affected zone.

Since the weld was very tough, this working did not overly process the joint, and the weld was planished perfectly smooth and flush with the base metal surafce. Planishing also eliminated the slight shrinkage common to butt welding without filler metal and removed any bowing along the weld axis caused by longitudinal shrinkage. Other effects of planishing are shown in Table II.

Caterpillar's new plant in Australia



Earthmoving equipment manufacturing plant just opened by Caterpillar of Australia Pty. Ltd. near Melbourne is reported to be the largest such plant in the Southern Hemisphere. Plant is on a 110-acre site, consists of a 216,000-sq-ft manufacturing building, 40,000-sq-ft warehouse, offices, cafeteria

Employee Gift Matching

Another Good Way To Help Our Colleges And Universities

The business community continues to make an impressive record in giving badly needed financial help to our colleges and universities. This year the Council for Financial Aid to Education expects that business contributions to higher education will be well over four times their total of about $40 million a decade ago.

If these contributions, which were about $150 million last year, continue to increase at the present rate, they will hit the target of $500 million set for business aid to our colleges and universities in 1970. This is the amount which, the Council calculates, must come from business if these institutions are to have the money to do their job properly a decade hence.

However, it would be a fine thing both for the nation and the business community if that $500 million dollar target were hit well before 1970. This would put us ahead of a schedule (it is a conservative schedule) in getting on top of what remains one of the nation's most crucial problems—that of having its colleges and universities adequately financed which they are very far from being right now.

There is, we believe, one quite simple way by which financial support for higher education by business firms might be considerably speeded up. All that is required is that business firms generally abandon the idea that it is possible for every company to have a program to provide such support that is novel and distinctive, and that this is the only way that interests of prestige and good public relations can be served.

There are nowhere near enough good plans to provide financial help for higher education to equip even a small percentage of our business firms with one that is novel and distinctive. Also **there are a number of very good plans which, so far as we can tell, lose nothing of their value for prestige and good public relations by being used by a large number of companies.**

The Gift Matching Idea

One plan with these attractive characteristics is the plan by which companies match the gifts of their employees to colleges and universities, and now increasingly gifts to independent secondary schools. So far as we can discover the general plan was invented by the General Electric Company, with what it calls its Corporate Alumnus Program. Now, with variations on the same basic design, almost 100 companies have gift matching plans. We at McGraw-Hill are included in this number.

The gift matching plans vary considerably in detail. Some are limited to alumni of the schools to be benefited. In others any employee can participate by making a gift to an eligible institution. There are also variations in the maximum amounts of gifts by individuals and to individual institutions which will be matched. Some companies have "open end" plans; others limit the total to be matched in any one year. All of the plans, however, embody the same central gift matching idea.

When the plan was first launched some college administrators of little faith in the fundamental generosity of the alumni and friends of their schools expressed the fear that if gifts were to be matched they might be made smaller in the first place. The opposing view was that the possibility of having them matched would stimulate more and larger gifts.

Advantages Of Gift Matching

So far as we have been able to discover, the expectation that giving would be stimulated by gift matching has been validated by the experience with the plans. This has been our experience at McGraw-Hill. Some other important virtues of the gift matching programs have been summarized by

LEADERS OF SOME OF THE INSTITUTIONS WHICH HAVE SHARED IN THE McGRAW-HILL EMPLOYEE GIFT MATCHING PROGRAM EXPRESS THEIR VIEWS

"We particularly appreciate the fact that your grant is unrestricted, and can therefore be used for our area of greatest continuing need — the General Education Fund, from which faculty salaries come."

W. Boyd Alexander, Vice President and Dean of the Faculty
Antioch College

"We are grateful, not only for the financial support given to The Cooper Union by your company, but also for the stimulus it has provided our alumni in your employ to make annual gifts to their Alma Mater."

Edwin S. Burdell, President
The Cooper Union

"The gift matching program has a dual advantage. First, it acknowledges and repays a debt of honor to those colleges which, often at great loss to themselves, have trained and educated the men who are now among your personnel. This is most fair and equitable. Secondly, by offering to match up to a given limit the contributions of alumni, you encourage support of their own colleges on the part of graduates, who themselves are so indebted."

President Edward B. Bunn, S. J.
Georgetown University

"Thanks to your doubling of the annual gifts of one of our generous and loyal friends who works with you at McGraw-Hill, we are well on the way toward creating what for us will be an extremely helpful scholarship fund. This would not have been possible without the gift matching program."

C. Adrian Heaton, President
California Baptist Theological Seminary

Ernest T. Stewart, Executive Director of the American Alumni Council (1785 Massachusetts Avenue, N.W., Washington, D.C.) who would be glad to provide detailed information about them, and the names of companies having such plans. Of the gift matching idea he says,

> "*First*—it assures the corporation that its gifts go direct to those colleges and universities which have furnished it with trained manpower.
>
> "*Second*—it places responsibilities for the gifts on the institutions themselves and drives home the point that they must make a real effort with their own alumni.
>
> "*Third*—it leaves the final decision of corporate support basically to the employees."

For many companies which are fearful of complicating their relations with their customers by courting charges of favoritism if they provide direct financial support for any particular school or group of schools, this latter consideration can be of decisive importance.

The gift matching plan also has what for many companies is the very important virtue of being simply and easily administered. Some additional virtues of the gift matching plan, as seen by officers of institutions which have been beneficiaries, are indicated in the box at the top of this page.

Effective And Easily Managed

We at McGraw-Hill are well pleased with our gift matching program. It is a broad program in which all employees and a wide array of colleges and universities, both privately and publicly supported, are eligible to participate. We commend it as an effective and easily managed plan to provide urgently needed financial aid to higher education.

We also urge that business firms adopt this or one of a number of other very good programs of financial aid to higher education* rather than delay in the hope of hitting upon some quite new and distinctive plan. There are very long odds that such delay will prove unavailing. In the meantime our colleges will be losing financial help which it is profoundly in the interest of the business community and the nation to see that they get—and get fast.

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*An earlier editorial in this series dealt with tuition supplements as another good way to help our colleges and universities. Reprints of this editorial are available. So are copies of a "more or less socratic dialog," entitled, **A Business Wrestling with the Problem of Aid to Colleges and Universities.** It was prompted by the efforts of McGraw-Hill to find suitable methods of providing financial aid to higher education.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT
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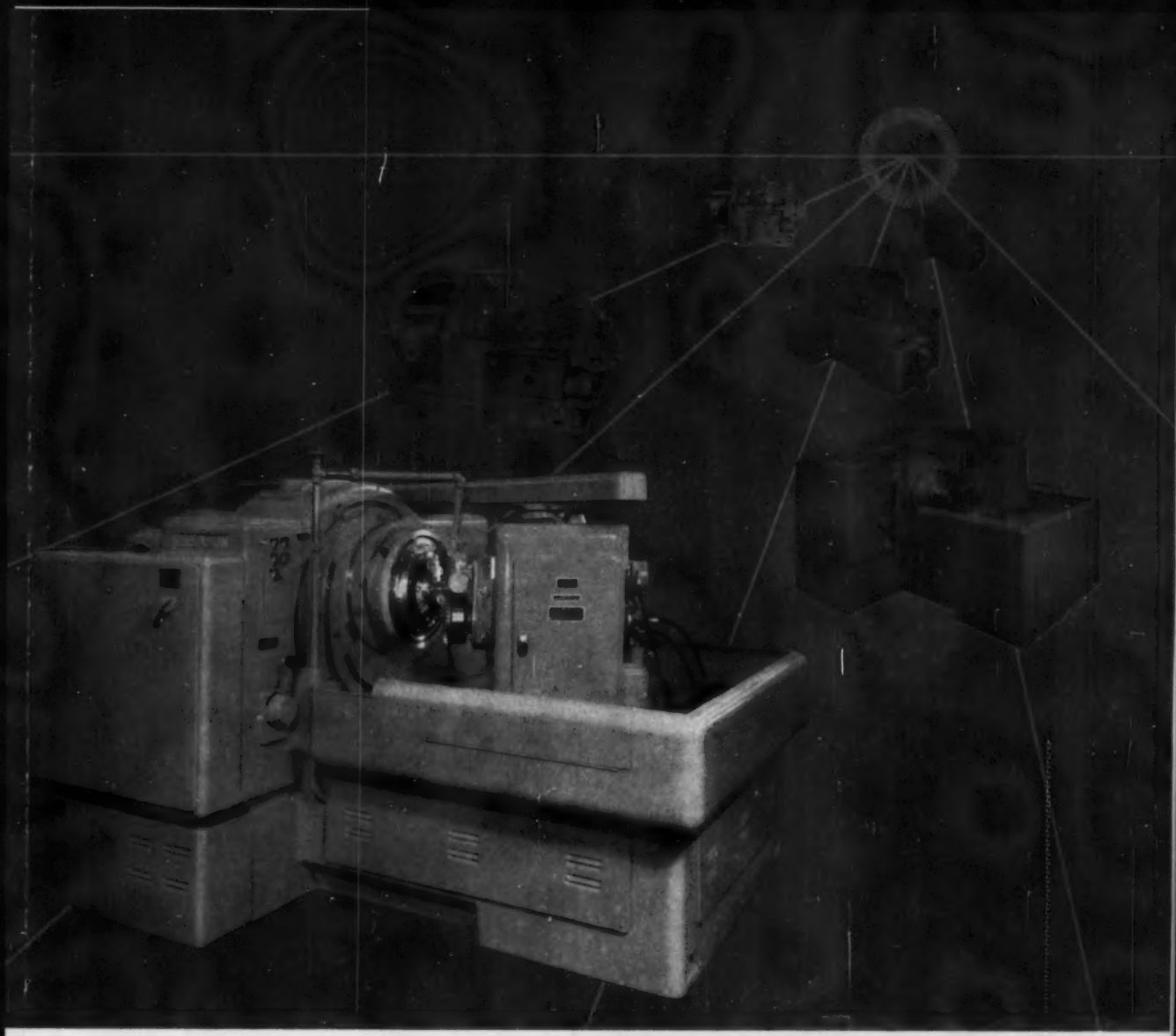

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Vol. 1 No. 16

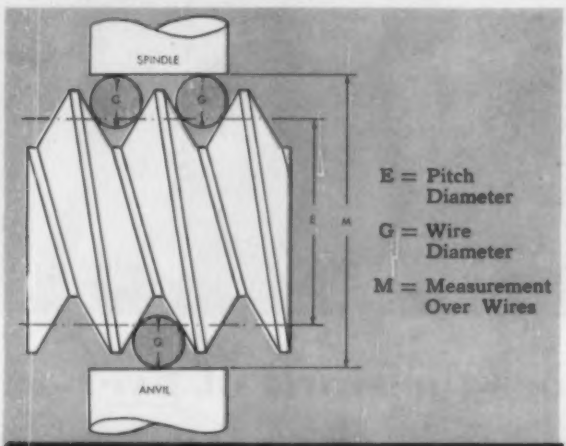
Subject: Three Wire Method of Measuring the Pitch Diameter of Straight 60° Screw Threads:

The three wire method of measuring the pitch diameter of straight 60° screw threads is one of the most accurate and satisfactory for the measurement of screws, thread plug gages, externally threaded products and taps having an even number of flutes.

This method of measuring the pitch diameter requires the use of some form of micrometer and three hardened steel cylinders or wires of correct size placed in the thread groove; two on one side of the screw and one on the opposite side as shown in the illustration below.

The "best size" wire for a given pitch is one that touches the exact mid-slope of a perfect thread. However, any size wire may be used that will rest on the sides of the thread and also projects above the major diameter of the thread.

The accuracy of the pitch diameter readings depend on the roundness of the wire diameters, the contact load and the accuracy of the measuring instruments. In most cases, if the "best size" wires are used, the slight effect of a lead angle of 5° or less need not be considered in the computation of the pitch diameter unless a very high degree of accuracy is necessary. For further reference, see the U.S. Dept. of Commerce, National Bureau of Standards Handbook H28 (1957) Part 1.



MEASUREMENT OVER WIRES

When the "best size" wires are available:

To pitch diameter, add constant for "best size" wire

Example: Pitch diameter of ⅜"-16 screw = .334400"
Constant for "best size" wire = .054126"
Measurement over wires = .388526"

When the "best size" wires are not available:

Subtract from pitch diameter, the constant for "best size" wire and to the result add 3 times the diameter of the available wire.

Example: Pitch diameter of ⅜"-16 screw = .334400"
Minus the constant for "best size" wire =.054126"
.280274"
Plus 3 times .040" (available wire) = .120000"
Measurement over wires = .400274"

Threads Per Inch	Pitch	Diameter of "Best Size" Wires	Constant* for "Best Size" Wires
80	.012500	.0072168	.010825
72	.013888	.0080182	.012027
64	.015625	.0090210	.013531
56	.017857	.0103097	.015464
50	.020000	.0115470	.017320
48	.020833	.0120279	.018041
44	.022727	.0131214	.019682
40	.025000	.0144337	.021650
36	.027777	.0160370	.024055
32	.031250	.0180421	.027063
30	.033333	.0192448	.028867
28	.035714	.0206194	.030929
27	.037037	.0213833	.032074
26	.038462	.0222057	.033308
24	.041666	.0240558	.036083
22	.045454	.0262428	.039364
20	.050000	.0288675	.043301
18	.055555	.0320746	.048112
16	.062500	.0360843	.054126
14	.071428	.0412389	.061858
13	.076923	.0444114	.066617
12	.083333	.0481123	.072168
11½	.086956	.0502040	.075306
11	.090909	.0524863	.078729
10	.100000	.0577350	.086602
9	.111111	.0641499	.096224
8	.125000	.0721687	.108253
7½	.133333	.0769800	.115467
7	.142857	.0824784	.123717
6	.166666	.0962246	.144336
5½	.181818	.1049726	.157458
5	.200000	.1154700	.173205
4½	.222222	.1282998	.192449
4	.250000	.1443375	.216506

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Machining Cobalt Alloys – I

By C T Olofson, principal metallurgist, Ferrous Metallurgy Div, and
F R Morral, consultant, Metallurgical Engineering Div, Battelle Memorial Institute, Columbus, Ohio

Reprinted by permission from "Cobalt"—No. 5, Dec 1959, published by Centre d'Information du Cobalt, Brussels, and available from the Cobalt Information Center, c/o Battelle Memorial Institute.

Cobalt imparts high strength at high temperatures to certain high-speed and hot-working tool steels, known as redhard tool steels. It is also an important component of "super alloys." The latter are used for high-temperature applications particularly in certain aircraft components. Table 1 lists some of the cobalt-containing alloys and their compositions.

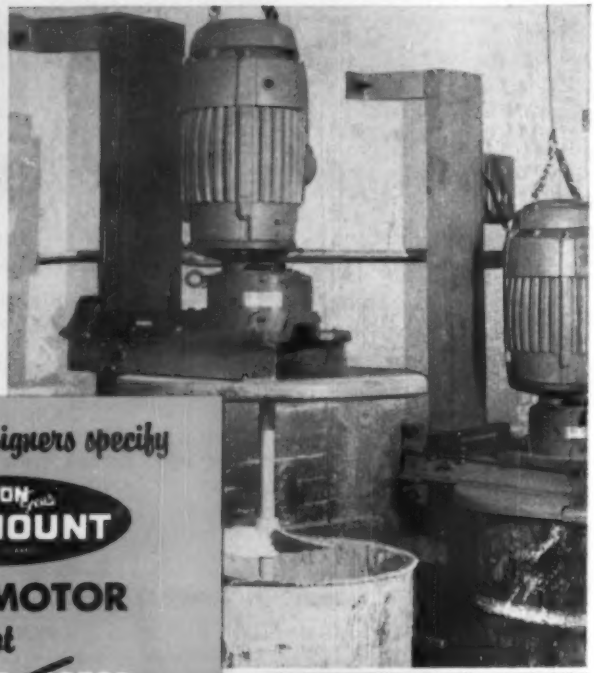
Although commonly so regarded, cobalt steels and alloys are not necessarily difficult to machine. In general, high-quality machine tools, sharp cutting tools of appropriate designs and materials, low speeds and feeds, a continuous cutting action, and intimate cooling by appropriate cutting fluids are the minimum requirements.

Cobalt is added to high-speed and hot-work tool steels to supply

TABLE 1—CHEMICAL COMPOSITIONS OF COBALT-CONTAINING ALLOYS[a]

TYPE AND NAME OF ALLOY	NOMINAL CHEMICAL COMPOSITION, %										
	C	Co	Ni	Cr	W	V	Mo	Cb/Ta	Ti	Al	Fe
Die steels											
AISI D2	1.5	0.75		12		0.5	0.9				
D5	1.5	3.25		12		0.5	0.9				
Hot-work die steel[b]	0.40	4.25		4.25	4.25	2.25	0.4				
Cobalt HSS											
AISI T8	0.8	5		4	14	2					
T4	0.75	5		4	18	1					
M15	1.5	5		4.75	6.5	5	3				
M35	0.85	5		4	6	2	5				
M30	0.85	5		4	2	1.25	8				
M34	0.85	8		4	2	2	8				
M36	0.85	8		4	6	2	5				
T5	0.8	8		4	18	2					
T15	1.55	5		4	12	5					
M6	0.85	12		4	4	1.5	5				
T6	0.8	12		4.5	20	1.5					
Iron base											
Therlo; Rodar; Kovar A		17	29								54
G. 18B	0.4	10	13	13	2.5		2	3			56
Hastelloy X	0.05	2.5		22	1.0		9				19
K-42-B	0.05	22	43	18					2.5	0.2	13
Refractaloy 26	0.05	20	37	18			3		2.8	0.2	18
Refractaloy 70	0.05	30	20	20	4		8				15
Refractaloy 80	0.1	30	20	20	5		10				14
N-155	0.15	20	20	21	2.5		3	1			32.5
S-590	0.43	20	20	20.5	4		4	4			27.5
Nickel base											
Inconel X	0.08	1.0	72	15				1	2.5	0.7	7
Konal		17	72						2.2		6.25
Nimonic 90	0.1	20	51	20					2	1	5
Inconel 700	0.13	29	46	15			3		2.2	3.2	0.8
Udimet 500	0.08	19.5	47	19			4		2.9	2.9	4
M-252	0.15	10	55	19			10		2.5	1	2
Waspalloy	0.10	18.5	51.5	19.5			4.25		3.0	1.25	2
René 41	0.09	11	55.5	19			10		3.0	1.5	
Cobalt base											
HA-25	0.15	51	10	20	15						
J-1570	0.2	38	28	20	7				4		2
J-1650	0.20	36	27	19	12			2	3.8	0.025	
S-816	0.38	40	20	20	4		4	4			4
G. 34	0.8	45	12	19			2	1.3			20
HS-21	0.25	62	3	27			5				
Vitallium	0.25	64	2	28			6				
X40; HS-31	0.5	55	10	25	8						1.5
Cobenium; Elgiloy	0.15	40	15	20			7	Mn 2			16
Rexalloy 33	2.25	44		33	11						2
Nivco 10	0.02	73.5	22.5						1.8	0.22	0.30

[a] Arranged approximately in order of decreasing machinability.
[b] A proprietary steel.



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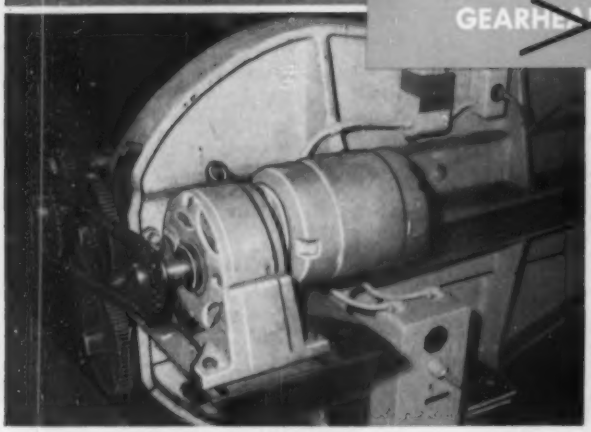

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— STANDARDIZATION PAYS —

Machining Cobalt Alloys – II

exceptional resistance to softening during high-temperature service. Because of their high hardness and abrasive qualities in the heat-treated condition, these steels are almost always machined in the annealed state. Their machinability ratings are lower than those of straight carbon steels. Hence, lower speeds must be used to obtain adequate tool life.

The super alloys are a group of complex iron-nickel or cobalt-base alloys exhibiting great strength and corrosion resistance at high temperature.

Some super alloys are machined in the solution-treated condition, some in a partially aged condition, and others in a fully aged condition. Aged alloys, although harder than those in the solution-treated condition, often machine more easily because of lower work-hardening tendencies. Solution-treated alloys, even those with an iron base, tend to be gummy.

In general, the work-hardening tendencies of super alloys resemble those of austenitic stainless steels. Therefore, many of the machining techniques used for those steels are also applicable for super alloys. Heavy-duty, vibration-free machine tools should be used for best results. Machines that may have to operate at capacity or beyond should be avoided as they are likely to chatter.

Cutting tools must be strong and rigidly mounted. A minimum of overhang, or the use of steady-rests, is required for minimum tool deflection. Tools should be ground with care. Cutting tools must have smooth tool-chip contact areas and sharp cutting edges.

Slower speeds and feeds than those used for stainless steel should be used for minimum cutting temperatures. The depth of cut should be sufficient to prevent burnishing or glazing. Second cuts should be avoided if possible, because these alloys are subject to strain hardening. If it is possible to stress relieve before machining, tool life can be extended.

Soluble-oil emulsions and chemically active oils are normally used as cutting fluids. Carbon dioxide, impinging on the cutting site, has been successful for certain machining operations on

TABLE 2—DRILLING DATA FOR COBALT-CONTAINING ALLOYS[a]

ALLOY DESIGNATION	CONDITION[b]	SIZE DRILL, inch	TOOL MATERIAL[c]	FEED, ipr	SPEED, fpm	REMARKS
G. 18B	Aged	0.10-0.50	HSS	0.0015-0.006	25-35	Use 28° helix angle and special points with four cutting edges. Use E. P. oil.
Waspalloy	Sol. Tr.	0.125-0.50	Carbide			
Refractaloy 26 Refractaloy 70 Refractaloy 80 K-42-B	Aged	0.5	HSS	0.003-0.007	15-30	Use sulfochlorinated cutting oils.
Hastelloy X	Sol. Tr.					
N-155	Aged	0.75-2	HSS	0.003-0.007[d]	14-20	Use 135-140° included angle; 10° clearance angle; 1/3 web thickness of standard drill.
S-590	Aged	0.25-0.75	HSS	0.002-0.004[e]		
Nimonic 90	Sol. Tr.	0.063-0.25	HSS	0.0005-0.002	10-20	
Inconel 700	Sol. Tr.	0.25-0.75	HSS	0.002-0.004		
Udimet 500	Sol. Tr.	0.75-2	HSS	0.004-0.006		
M-252	Sol. Tr.					
Inconel X	Sol. Tr.					
René 41	Aged	0.25	HSS		12-20	Use 135-140° included angle; 10° clearance, 1/3 standard web thickness. Soluble oil and lubricant added has been used.
HA-25						
J-1570		0.125-0.5	Carbide tipped	0.001-0.003		
J-1650						
S-816					12-18	
G. 34		0.125-0.5	Carbide tipped	0.001-0.003		
HS-31						
X-40						
HS-21			Carbide tipped	0.001-0.003	12-18	
Rexalloy 33			Masonry-type carbide drills	Fine	Slow	Use a good coolant.

a Arranged approximately in order of decreasing machinability.
b Best condition for drilling.
c HSS = high-speed steel
d Rough.
e Finish.

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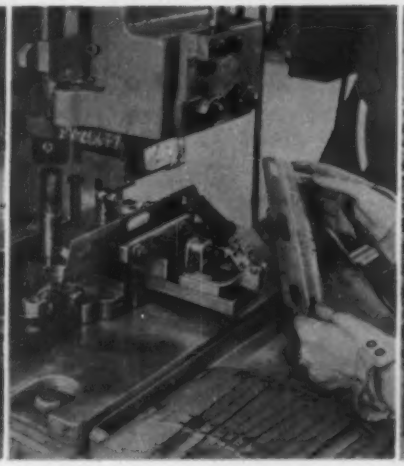
39 OBI'S GIVE PRESS DOLLARS 3-WAY STRETCH

Newly installed Niagara Inclinables provide required precision at lower investment, produce more parts per hour, and cut maintenance to the bone

SERVING ONE OF THE WORLD'S LARGEST typewriter manufacturers in a brand-new plant, 39 new Niagara Series A Open Back Inclinables play a key role in the production of nearly 2000 precision parts for portable machines. With selection based on past experience, these presses are more than living up to expectations . . . performance-wise and dollar-wise.



.001" TOLERANCES ARE MAINTAINED as Niagara OBI's engage in a wide variety of piercing, notching, trimming, bending and intricate forming operations. Here, a hinge tab is given a final bend on a 22-ton Niagara Series A. Rigid press frames and short-coupled, multiple "V" gibs not only insure precise production, but lengthen die life.

BOOSTING PRODUCTION 30%, these fast-acting hand fed OBI's turn out an average of 1300 pieces an hour per machine. The reason: Instant clutch engagement and disengagement at every press stroke provide more working strokes per minute. Niagara's famed multi-point mechanical sleeve clutch picks up the load on 14 engaging jaws and applies driving force concentrically without keys or pins.

EVERYTHING HUMS ALONG SMOOTHLY day after day. Niagara OBI's are unmatched for dependability and safety. With fewer parts and simpler construction, there's less to go wrong . . . less to repair and replace. No complicated electrical circuits, limit switches or solenoids . . . no palm buttons, air valves or rotary connections.

MAINTENANCE IS SHAVED TO AN "ABSOLUTE MINIMUM" according to this Niagara user. Unlike other presses previously utilized, these Series A's do not require constant "doctoring." There's no need for frequent adjustment of the clutch sleeve and brake. No "dogs" to break off and require replacement. No press can match its economy.

WANT TO STRETCH YOUR PRESS DOLLARS, TOO? Write for illustrated Bulletin 58 containing the facts and figures on Niagara Series A Open Back Inclinable Presses (built in 13 standard sizes with shaft diameters from 1¼" to 6½" and capacities from 5½ to 190 tons). *Niagara Machine & Tool Works, Buffalo 11, N. Y., District Offices and Distributors Everywhere.*

NIAGARA OBI PRESSES

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

Machining Cobalt Alloys – III

super alloys. Air-oil-mist coolants can be used when milling with carbides.

Drilling

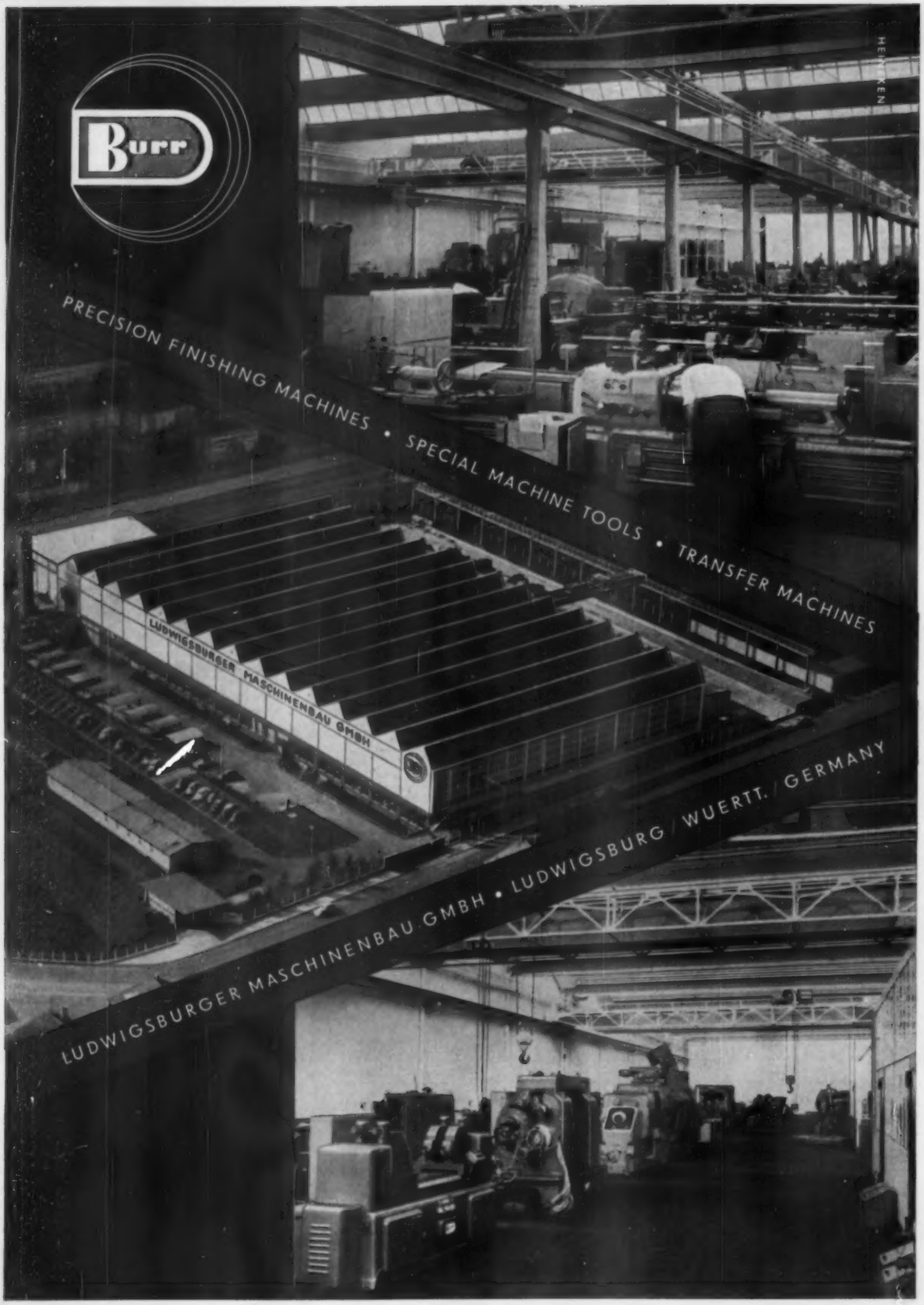
Drilling is the most difficult machining operation to perform on cobalt-containing alloys. The point of the drill constantly rubs against the bottom of the hole. This action can work harden the metal to the extent that early tool failure results. Therefore, a positive feed is essential, and the drill must be kept sharp. While drilling deep holes, the drill should be pulled frequently from the hole to free it from chips, and to prevent overheating. It may also be necessary to resharpen the drill at least once or twice during the operation. Nevertheless, the cylindrical wall will work harden to some degree. Hence, it is not practical to use pilot drills because the drill used to open the hole may fail very rapidly.

Most drilling operations are done with cobalt grades of high-speed steel. Drills should be as short as possible and of heavy duty design.

TABLE 3—MILLING, BROACHING, REAMING, AND SHAPING COBALT-CONTAINING ALLOYS

ALLOY DESIGNATION	CONDITION	TYPE OF CUT	TOOL MATERIAL[a]	FEED	DEPTH OF CUT, inch	SPEED, fpm	CUTTING FLUID
MILLING							
G. 18B	Aged		HSS	0.0015-0.006 ipt	Maximum possible	25-35	Soluble oil
Refractaloy 26, 70, 80 K-42-B	Aged		HSS			30-60	Sulfo-chlorinated oils
N-155 S-590	Aged		HSS	0.5-1 ipm	0.1-0.2	15-25	Sulfo-chlorinated oils
Hastelloy X	Sol. Tr.						
M-252 Nimonic 90 Inconel 700 Udimet 500 J-1570 J-1650	Solution treated	Rough	HSS	0.002-0.004 ipt	0.01-0.15	25-35	Sulfo-chlorinated oils
			Carbide	0.006-0.010	0.125-0.25	40-60	
Waspalloy	Aged	Finish	Carbide	0.003-0.006	0.03-0.125	60-100	
HA-25			HSS	0.5-1 ipm	0.1	15-17	
S-816			Carbide	1 ipm		75	
BROACHING							
Refractaloy 26, 70, 80 K-42-B			HSS	0.002 ipt		8-12	Sulfo-chlorinated oils
René 41			HSS	0.002 ipt		15-20	
REAMING							
N-155 S-590 Hastelloy X		Rough Finish	HSS HSS	0.006-0.01 ipr	 0.012-0.015	7-13 7-13	
HA-25		Finish	Carbide	0.01-0.02 ipr	0.008-0.01	8-15	
SHAPING							
N-155 S-590 Hastelloy X		Rough	HSS Carbide		0.05-0.08 0.06-0.09	13-15 20-30	
		Finish	HSS Carbide	0.005-0.01 ips	0.018-0.025	13-15 20-30	
HA-25		Finish	Carbide	0.009 ips	0.01 -0.015	10-12	

[a] HSS denotes high-speed steel, preferably the cobalt types. Cast iron grades of carbides are used (C-1 or C-2).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PRECISION FINISHING MACHINES • SPECIAL MACHINE TOOLS • TRANSFER MACHINES
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Talking Shop...

Safety Crimes

A WAY TO DRAMATIZE safety has been found by the employee publication at Armco Steel. A series of pictures dramatizes the events leading up to an "accident." Readers can solve the "crime" by spotting the things that were done that caused it or weren't done that could have prevented it. Solutions, in approved photo-crime fashion, are printed upside down at the bottom of the page. Kudos to *Arm-co-operator editor* C E McIntire and his staff.

60¢ Problem

IN THE STUDY of missiles on TV by Ed Murrow and Fred Friendly, emphasis was put on the countdown in which all the factors that may go wrong are checked. From the errors they catch—and the ones they don't—it appears that the trouble is not in big mistakes, but in little ones. "Most of the mistakes are sixty-cent errors."

Calling our attention to this, Rogers, Slade & Hill say that most executives, based on experience, would put that quoted sentence in bold-face caps.

Mobile Gage

IN THE MACHINABILITY labs at General Electric a gaging setup on a surface plate would have been simple if one of those handy DR 25 gaging units could have been used and if it had been easy to move around on the surface plate. The gage is a little heavy to reposition conveniently, however. Or at least it was until one of the engineers thought of mounting the gage on a steel plate with a hole in the center connected by a tube to a syringe. A quick squeeze on the bulb of the syringe puts enough air lift under the instrument that it can be moved easily over the surface plate. The original idea was to connect to the shop air line, but the syringe provided enough air and eliminated problems of condensation.

Split Point Drills

SOME MONTHS AGO we reported a modified split point drill grind for use in drilling superalloys (*AM*—Aug 24 '59, p2). Several attempts are reported to adapt this design to drills of standard web thickness and the results have not always been happy. The conventional split point will usually perform well on standard materials. Using the modified split point may improve drill point centering. If this fact induces you to try it, National Twist suggests that you further modify the original instructions for heavy-web drills. By using a splitting angle of about 150°, you will reduce the effect of errors in splitting. Details of the new suggestion are in the April issue of *Metal Cuttings*, published by National Twist Drill & Tool Co.

Rust Prone

PARTS HANDLED are more likely to rust when handled by some people than by others. This fact has long been known and we recall tests in plants making precision aircraft parts during World War II that disclosed that the fingerprints of women are more likely to cause corrosion during their monthly periods than at other times.

Now two doctors at Eastman Kodak have developed four classes of "sweaty hands." The rusters fall in Group IV. The first three groups don't generally cause corrosion. However, Dr William Buckley and Dr Charles Lewis, of Kodak's medical department, say that excessive salt intake can cause concentrations of chloride ions on the hands of any of these groups.

Pinkerton Tips

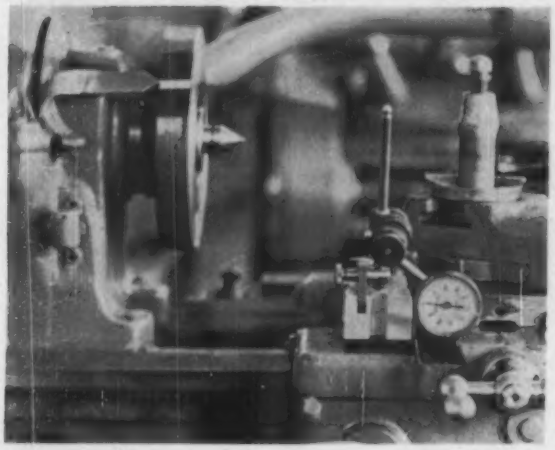
MANY A PLANT today is guarded by Pinkerton men and in the guard training program at Pinkerton, the men are taught 15 principal safety hazards in plants. On his rounds, the guard is to watch for these, not only for his own protection but to correct or report as hazards to others.

We think they are a good list for your own guards—whether Pinkerton, Burns, or your own men:

1. Slippery floors
2. Tripping hazards such as hose lines, piping
3. Inadequate warning signs at excavations, manholes
4. Missing (or inoperative) entrance, exit lights
5. Poorly lighted stairs
6. Loose handrails or guards rails
7. Aisle or street obstructions blocking access of fire equipment
8. Overheated motors
9. Loose or broken wiring
10. Open fire doors
11. Running motors not in use
12. Defective ladders or scaffolding
13. Leaks or unusual fumes
14. Broken windows or doors
15. Dangerously piled supplies or equipment

Practical Ideas...

Indicator Sets Taper Attachment



There's no great problem in setting a taper attachment when the taper to be turned is standard and a taper gage is available. But the methods are many and varied in making the adjustment without the help of gages, most of them winding up by cutting and trying. If you are lucky at this, you may hit it just right after a few tries, but chances are that the work may be spoiled before you do. In any event, this approach is time consuming if nothing else.

To eliminate guess work and to cut setup time, I use the arrangement shown in the photo. It is a means of accurately checking the travel of the cross feed in relation to the carriage motion on the lathe bed. In this way I can read the exact path of the tool even before it touches the work. It gives me one half of the included taper per inch for each inch of carriage travel.

The equipment necessary to check and correct the taper attachment is a dial indicator mounted on a magnetic base and a pointer affixed to the headstock.

The first step in this process is to set the attachment as accurately as its graduations will allow. Then, with the change gears set to feed the carriage at 4 tpi (or any easily calculable pitch), and with the lathe operating at the lowest possible speed, the half nuts are engaged and the lathe stopped. This is to remove all backlash in the lead screw and taper attachment.

While the lathe is thus at rest, a scribe mark is made on the periphery of the chuck or face plate in line with the pointer. The indicator is next placed on the carriage in contact with the cross slide and zeroed out. Now, when the lathe is operated, four full revolutions of the spindle moves the carriage 1 in. (or eight revolutions 2 in.) during which time the indicator is observed for cross slide movement.

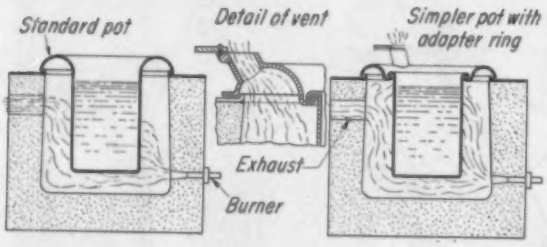
Where the taper is very slight, accuracy can be increased by allowing the carriage to travel several inches instead of just one or two. At other times, when the capacity of the indicator is not enough, a stop and size block may be used.

A quick adjustment of the attachment, though not as reliable as the method described, can be made by mounting the indicator to contact the adjustable portion of it. Moving the carriage by revolution of the feed screw as before, will give a fairly good check.

The formula for using the indicator on the cross slide is: Amount of corrective movement of attachment = the error in cross slide indicator reading per inch of taper × number of inches from center of attachment pivot to point of indicator contact.

Howard Selleck, Tustin, Calif

Adapter Ring Permits Use of Less Expensive Salt-Bath Pot



Not only does a separate adapter ring or collar save cost in maintaining pots for a gas fired furnace, but it also helps to distribute the heat more evenly; and here's how.

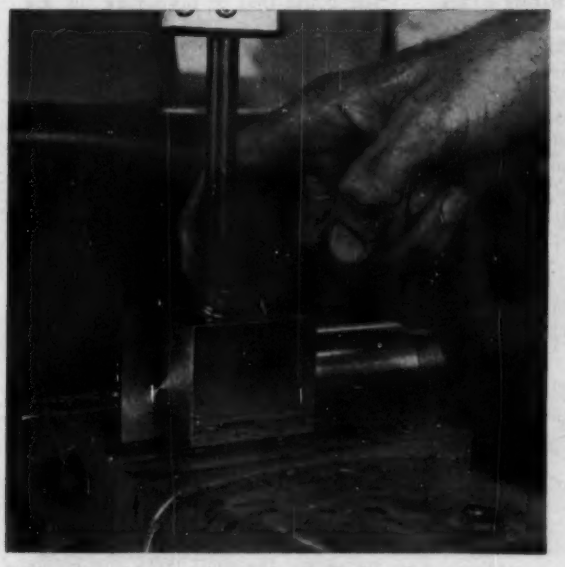
The pots generally employed are of one-piece construction and are expensive to replace when burned out. Even greater is the cost when they are made of heat-resistant alloys. Their construction, the large radiused flange on which they rest in the furnace, is another factor contributing to their high cost. Yet, this is the section of the pot that never gives way because the heat here is not as intense as around the lower section.

This unbalance is eliminated by an adapter ring which makes it possible to use pots with but a small hook-on flange and are consequently less expensive. The adapter ring, being a separate part, is made of plain carbon-cast steel and will outlast four or more pots.

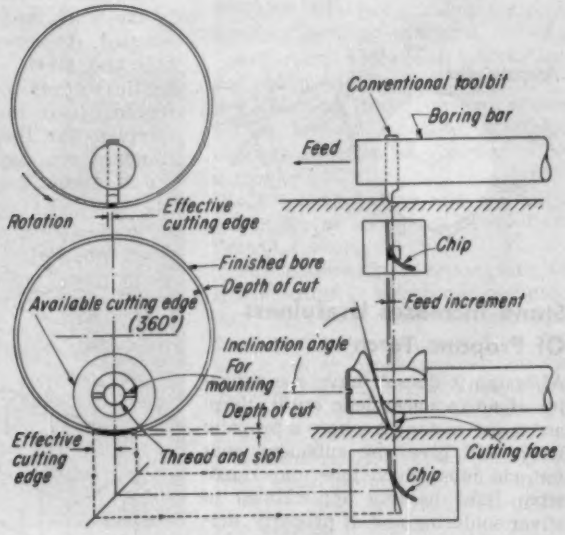
Now for the improved distribution of heat. Two ports with swing covers are added to the adapter to raise the height of the effective combustion gases. Some of the gases will then escape through these ports as well as through the regular exhaust outlet. As a result, the pot is heated to the very top—the adapter sometimes reaching a temperature of 1400 to 1450° F—the most economical way of starting and maintaining a pot until the salt melts. When this point has been reached, it's an easy matter to control the rise of the heat by regulating the swing covers.

John Obreski, metallurgist, Monarch Machine Tool Co, Sidney, Ohio

Helical Boring Tool Gives Good Finish and Long Life



Ribbon-like chips are the result of a high inclination or shear angle of the helical boring tool which works like a float file. Here, operator springs bar away from workpiece during retraction



Conventional boring tool, ground to steep shear angle, compared with helical tool shows increase both in effective cutting edge and in available cutting edge between resharpenings

Conventional boring tools tend to chatter in deep holes because of the bar overhang and slenderness. To overcome this, I experimented with a toolbit ground to an extremely high inclination or shear angle (equivalent to tilting the cutting edge until almost parallel to the direction of work-tool motion). This solved the chatter problem all right, but the toolbit was a nuisance to maintain.

It then occurred to me that I might chase up a long helical buttress out of tool steel, cut it into convenient lengths, and harden and grind the individual sections. The result is a tool ¾ in. long with a ¾ in. dia over the cutting edges. It is tapped ¼—20 for mounting on the stud of the boring bar. The lead of the helix is ¾ in. which gives a full 360° of cutting edge by rotating the bar in the holder as the need arises.

As the normal downfeed or infeed causes the tool to cut on what would first appear to be the back face, the resulting force tends to pull the tool into the work. The feed should, therefore, be extremely light in any operation of this type and only a small sector of the cutting edge is used on a given cut. This produces an excellent surface finish.

The fact that the tool can be rotated by rechucking the bar has an added advantage. When this is done to present a fresh cutting edge, accuracy is not affected. And then, too, an extra high tool life between resharpenings is possible.

William Bonham, shop foreman, USI Technical Center, Pompano Beach, Fla

Adapted Micrometer Measures Staggered-Tooth Cutters

If your work with staggered-tooth cutters is of such proportions that it becomes annoying to use a small parallel in sizing them, this may be what you've been looking for. But, by the same token, if you only do this work occasionally, the alteration of a fine instrument like a micrometer may not be justified. The decision is yours.

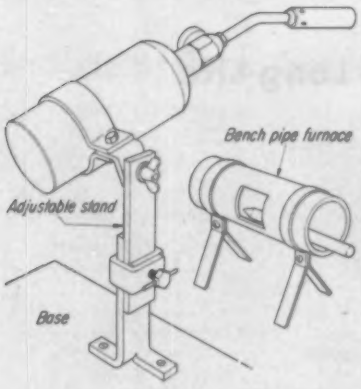
In our case, however, the adaptation of a bridging anvil not only

saves us time, but makes the job of measuring cutter widths easy and convenient. Our daily need for this tool certainly made this change worth while.

The revamping consists of first removing the regular anvil and then grinding a notch 3/16 in. deep by 5/16 in. wide into the frame. Into this notch is soldered a 2½ in. length of 3/16 x ⅜-in. carbide at 90° to the spindle. After grinding the inside face of the carbide to as near the original anvil height as possible, the micrometer is checked and readjusted as necessary.

William E Koogle, tool-grinding foreman, Baker Oil Tools Inc, Los Angeles, Calif

Practical Ideas...



Stand Increases Usefulness Of Propane Torch

Although it doesn't have the capacity of an oxy-acetylene outfit, there are many instances where a propane torch will give you sufficient heat for odd jobs. Such jobs may range from light heating applications to silver soldering and, if properly supported, the torch can be made to fire a bench-pipe furnace for heat treating small parts.

A support to fill this requirement is the stand shown in the sketch. It is adjustable in height and angular setting and, being mounted on a heavy steel block, it can also be swung radially placing it in any position.

The stand is made in two sections which are joined with a clamp to allow raising and lowering. A heavy steel block serves as base making the unit portable, and a piece of strap iron, bent into a loop, clamps the tank to the top of the stand. By use of a piece of angle iron to mount the tank clamp, the torch nozzle can be swung up or down as desired.

Charles Willey, Penacook, NH

Pipe Tapping Made Easier

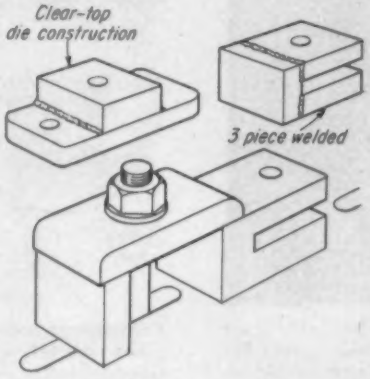
Pulling a pipe tap to put a thread into a drilled hole, and depending on the material, can sometime be anything but easy even when the tap is less than 1 in. If you've tried it, you know what a struggle it can be.

The reason for this is in the fact that as a tap goes deeper it has two jobs to do. First as a tap, and secondly as a taper reamer. But in the last capacity it's a poor performer.

Here's where a worn and discarded tap can again be put to useful service. From it, a perfect pipe-taper reamer is made by grinding the OD down until the root diameter is just cleaned up. Each flute is then backed off to produce good cutting edges.

Now, after a hole has been drilled in the work, and before the tap is inserted, the reamer is placed in the hole and given a few turns to the depth required by the tap for a full thread. It is then child's play to complete the threading job with a standard pipe tap.

J M Atkins, Lufkin, Texas



Piercing Die Made and Used in Drillpress

If you haven't already a punch plate for making holes in light metal and gasket material, here is a quick-and-easy way you can do this work without great cost. For all practical purposes, the entire process is carried out in the drillpress; the only exception being that of preparing the die block.

This part of the job will depend on the nature and size of the work; i.e., whether the work is in the form of a sheet requiring holes at irregular locations, or whether the holes must be located from a specific edge. To fill the first need, a plain block without a stripper and above-surface projections is used. For accurate edge-to-hole locations, a block with a stripper is made up either by welding three pieces together as shown or by milling a slot through a solid block. The prepared die block is now located on the drillpress table over one of the slots or the center hole, preferably over the center hole, and secured. The proper-size drill is then selected and a hole is drilled through the block.

When this has been done, a punch can be made out of the drill. After removing the drill from the chuck, simply grind the shank end flat and replace it in the chuck upside down. But for a more permanent punch, a piece of drill rod is easily turned down to fit the requirement. Punch and die can then be stored and again be put to use should there be a need to repeat the same operation.

Earle Carlin, Cobalt, Ont, Canada

Frank Bachula
Bridgeport, Mich.
Won $25 for his idea:

INDICATOR ASSURES UNIFORM DEPTH OF CENTER HOLES
March 21, 1960

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning idea is made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors, without reservations or bias, as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc., and those of its advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

New Shop Equipment
Materials and Parts

Gorton's In-Line Transfer Machine Drills And Mills Receiver for Army's M-14 Rifle

Unit design transfer line performs milling and drilling on three faces of forged steel receiver for Army's new, lightweight M-14 rifle. Designed for Winchester Western Division of Olin-Mathieson Chemical Corp, the machine is a unique application of the building block principle to the manufacture of small arms, according to the manufacturer.

Two machines of similar types, each having sixteen stations, perform vertical and horizontal milling, angular milling, undercutting, drilling and automatic tracer-controlled profiling and duplicating. They have a twin-fixture platen arrangement which allows two passes through each machine.

Machine No. 1 uses a 360° electro-hydraulic tracer system at station 7 to mill the sight base section of the receiver. An in-cycle feed regulator slows the feed rate in sharp radius corners and increases it on straight cuts and traverse motions. Machine No. 2 has a 180° electro-hydraulic tracer system at stations 25, 26, and 32.

The design places heads at many different angles so that standard cutters can be used wherever possible. This is apparent in the photo of the drilling and milling stations midway in the operations of machine no. 1

In the machining operations, the steel forged receiver which weighs about 2 lb 7 oz is reduced to a weight of 1 lb 6 oz. Therefore, the chip problem was complicated and was handled in three different ways:

- Through an exhaust system during rough and finish cutting.
- Dumping into a conveyor system at far end of machine as platen changes direction on over and under conveyor.
- Flushing fixture and workpiece which drains and dries on return to unload station.

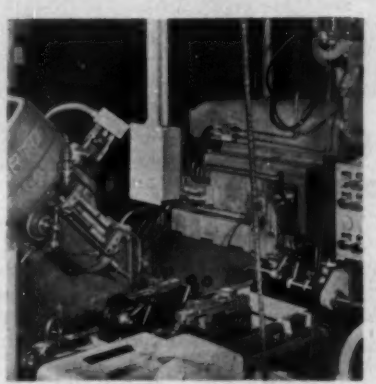
The planned production rate for this machine is 45 seconds per piece part. Indexing time for conveyor from station to station is 3 sec. To check cutter breakage, electric eye probing stations are utilized. Preset tooling for each machine station is stored in convenient tool boards.

Dimensional tolerances hold range from ±0.15 in. for some of the milled surfaces, to ±0.0005 in. for the drilled and reamed holes.

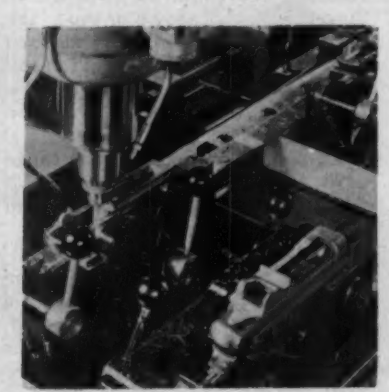
Each conveyor platen carries two fixtures. There are 43 platens per conveyor. Each fixture has been zeroed in by auto-colliminator for precise location. Each platen is individually located at each machine station and locked in position by hydraulic cylinders. Therefore, the relation of one platen to another is not required in this design.

George Gorton Machine Co, Racine, Wis

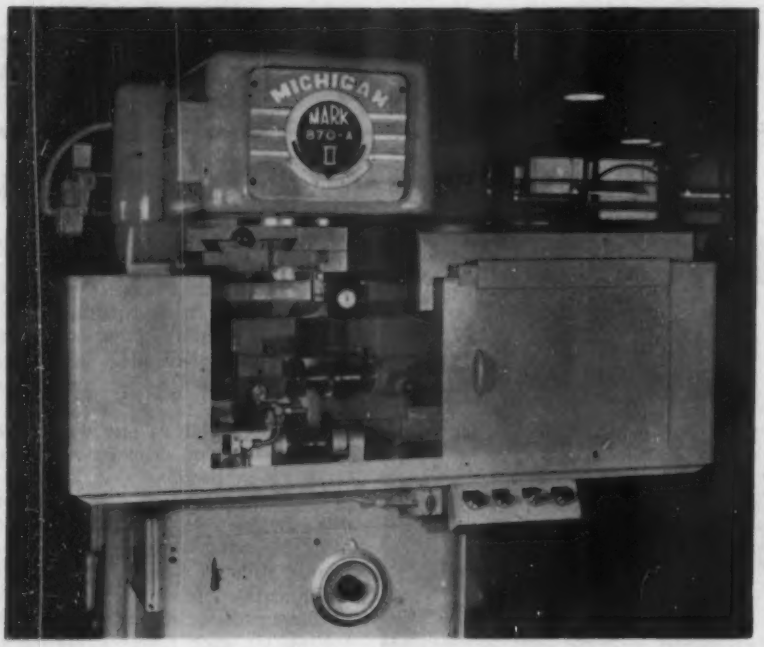
MORE DATA? Circle 51, inside back cover



Milling and drilling station midway in the operating sequence of machine No. 1 Designers placed heads at many different angles so that standard cutting tools could be used in as many places as possible.



Twin-fixture platen arrangement allows two passes through each machine. The part in near fixture has just been loaded for first pass of eight stations, and the one in far fixture is in operation at station 9, beginning its second pass.



Line of Rotary Gear Shavers Provides Dial Control for Most Machine Functions

Line of rotary gear shavers, the 870 Mark II, consists of three types of machines—underpass, internal and universal—in three sizes to handle gears up to 8, 12 and 18 in. dia. and up to 12 in. dia for internal gears.

The majority of machine settings are dial controlled. By changing the settings, the universal machine can perform underpass, modified underpass or transverse shaving. Rate of crossed-axis feed is dial controlled as is vertical feed rate for transverse shaving, length of transverse reciprocation, and length of work travel. To set amount of crown or taper, the head is set to a position indicated by a pointer and scale. Hand crank is used to raise or lower the knee or for setting the amount of crossed axis.

Air-operated upfeed has a range of 0 to 0.040 in. in increments of 0.001 in. Four fine feeds range from 0.0005 to 0.002 ips.

Length of travel of work is indicated on the front of the head. The pointer indicates the position of the traverse slide in relation to the center of the machine. An attachment permits crown and/or tapering of teeth during transverse of modified underpass shaving.

The standard machine, using modular construction throughout, is equipped with a 2-hp 1800-rpm main drive motor, 1/3-hp variable-speed motor for traverse feed and a 1/10-hp coolant motor.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 52, inside back cover

Splice Welder Produces Fifteen Welds per Second on Honeycomb

Splice welder, designed for high-speed splicing of critical honeycomb core materials, can average 12 to 15 welds per second, according to the manufacturer.

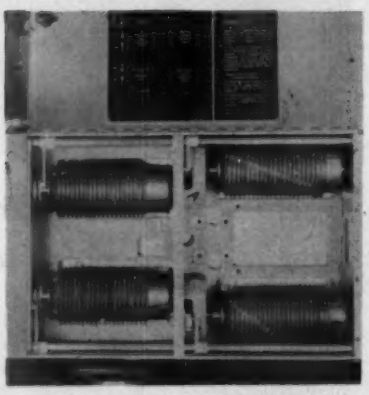
Except for one electron tube, the unit is composed entirely of transistors and other solid-state devices. The welder comes complete with power-operated tweezer head, solenoid valve, air pressure regulators, tweezer head support beam and all cables and connectors.

Weld pulses are transmitted to the tweezer only at optimum points set up by the operator. An air cylinder provides adjustable mechanical pressure. By holding the button for continuous operation, the operator can make as many as 15 welds per second. Each weld is a separate operation, triggered automatically when proper pressure on tweezer points has been reached.

Both welding frequency and interval spacing are adjustable. It is possible to produce high-quality nodes in materials from 0.001 to 0.010 in. thick. It requires 230-v 60-c power with a source capable of supplying average current of 15 amps with 50-amp peaks.

Hexel Products, Inc, 2332 4th St, Berkeley, Calif

MORE DATA? Circle 53, inside back cover



Size Control Feature Incorporated In All Bullard Dynatrol VTL's

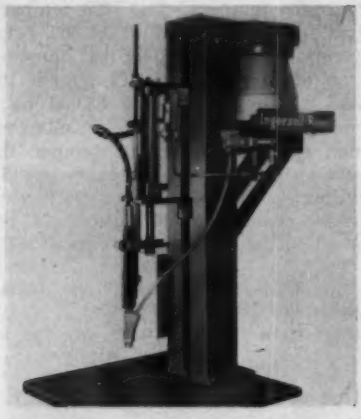
Size-Au-Trol, a new standard feature on Dynatrol vertical turret lathes, brings the cutting heads automatically to a stop when they reach pre-set positions during each successive stage of the machining operation. After initial setup, repetitive accuracy of head positioning to limits of 0.0003 in. in either axis is assured. It can be applied to regulate internal boring as well as external turning, and to control both internal and external facing. It is reported to be especially advantageous in machining blind holes.

Size-Au-Trol operates by means of a system of electro-mechanical devices that provide a positive linkage between the control system and the rapid traverse and feed drive to the turret and other cutting heads. This system makes use of rotating drums which are made up of adjustable discs, one

for each positioning function. Discs provide the means for making contact with a series of corresponding switches which operate a solenoid valve to engage or disengage the clutches that apply power to the horizontal and vertical feedscrews.

Bullard Co, Bridgeport 9, Conn

MORE DATA? Circle 54, inside back cover



Automatic Screwdriver Permits Rapid Screw Pattern Changeover

Screw patterns can be changed quickly on the Rapid Automatic Fastening screwdriver by loosening and tightening only two bolts per powerhead. Capable of running screws in 1½ seconds, the screwdrive can drive almost any number of screws in almost any production pattern.

Three power ranges are provided with motors running to stall in each range to drive screws to an accurate preset torque. Powerheads can be located on 2-in. centers. Measurements are: 42⅜-in. column height, 24 x 24-in. standard base, 8 5/32 to 14-in. throat, 6-in. stroke.

Ingersoll-Rand Co, 11 Broadway, NY 4, NY

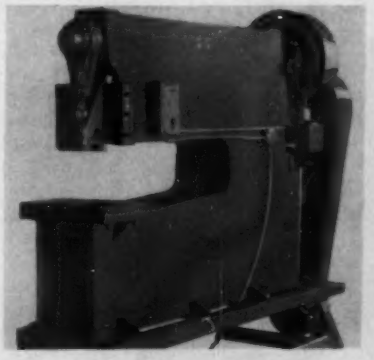
MORE DATA? Circle 55, inside back cover

Kaiser Offers Improved Screw Machine Stock

Improved 2011-T3 alloy screw machine stock, called Micro-Chip, is said to provide substantially better machining qualities and a brighter and cleaner surface. It makes possible finer chips for longer cutting tool life and offers greater consistency in machining characteristics from lot to lot.

Kaiser Aluminum and Chemical Corp, 300 Lakeside Dr, Oakland 12, Calif.

MORE DATA? Circle 56, inside back cover



Punch Press Has 40-Ton Capacity, 36-Inch Throat

Electrically operated punch press with 40-ton capacity and a 36-in. throat operates at 84 spm. Throat height is 12 in. Throat depth is completely usable because no tie-bars or other strengthening devices are needed.

Solenoid operated, pin type, non-repeat clutch can be converted easily to repeat. The hole in the ram accepts punch and die sets with 2-in. shanks. Smaller shanks can be used with bushings or adapters.

Whitney Metal Tool Co, 724 Forbes St, Rockford, Ill

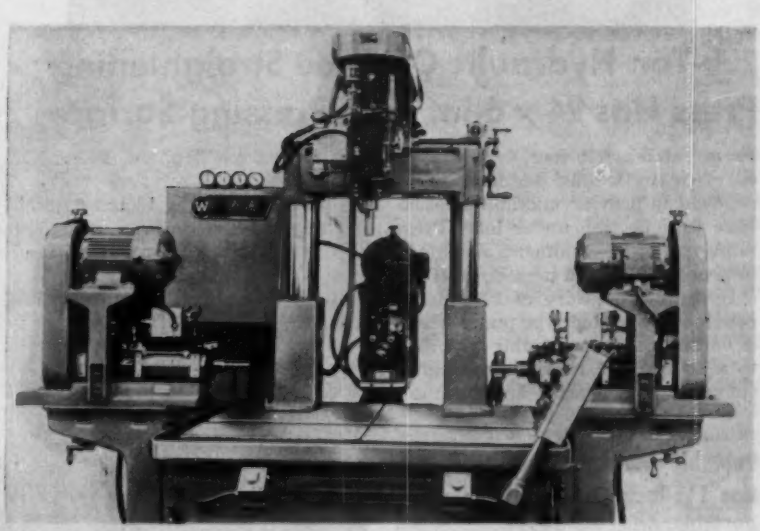
MORE DATA? Circle 57, inside back cover

Long-Length Tantulum Tubing Produced by Calumet & Hecla

Seamless tantalum tubing in lengths up to 60 ft is available in sizes from 0.453 to 1.500 in. OD and in wall thicknesses from 0.015 to 0.125 in.. Made by extruding a solid piece of metal through a die, it is free from welds and joints. Recent advances in extrusion technology have made possible the production of longer lengths of this and other special metals in the company's developmental facility.

Wolverine Tube Div, Calumet & Hecla Inc, 17200 Southfield Rd, Allen Park, Mich

MORE DATA? Circle 58, inside back cover



Multiple-Head Drilling Machine Can Process Five Sides of Workpiece in One Work Cycle

Capable of drilling, tapping, boring, reaming, and spot-facing, the Wis-Matic is available with any combination of one to four horizontal power units and one vertical power unit.

Each power unit is adjustable in vertical, lateral, and longitudinal planes, and all vertical adjustments are counterbalanced. Each power unit can be run independently of others, and cycle selector, in electrical control panel, permits actuation of power units on first or second pass or in any multiples. Instantaneous change-over from drilling to reverse tapping can be accomplished from the master control station for any unit.

Specifications include: 15 to 34½ in. vertical head travel; 5 spindle speeds; 1800 rpm motor with spindle speeds from 575-3500; 6 in. spindle travel; 0-240 ipm feed rate; ¾-3 motor hp per spindle.

Wisconsin Drill Head Co, Butler, Wis

MORE DATA? Circle 59, inside back cover

200-Ton Hydraulic C-Frame Straightening Press Has 24 x 6-in. Ram Pressing Surface

Press, rated at 200 tons, is constructed of heavy welded sections, stress relieved to provide maximum resistance to deflection under load. Press table is a steel weldment, machined to present a smooth pressing surface.

Hydraulic pressure of 2000 psi is provided by a vane-type pump which is connected, by a flexible coupling, to a 10 hp 1200 rpm electric motor complete with starter and pushbutton station for 3 phase, 440-v, 60-c current.

Stroke of press is 18 in., daylight opening 18 in., and ram pressing surface is 24 x 6 in. Speeds are: advance, 250 ipm; press, 8 ipm; return, 86 ipm. Overall dimensions of press are 6 ft. 0 in. x 15 ft. 8 in. x 15 ft.

Farrel-Watson-Stillman, 565 Blossom Rd., Rochester 10, NY

MORE DATA? Circle 60, inside back cover

New Screw Machine Stock Alloy Features Improved Machinability

Alloy X6262 offers better machinability and greater strength than alloy 6061 (one of the four standard screw machine stock alloys), and possesses corrosion resistance and finishing characteristics comparable to 6061.

The new alloy is available in –T8 and –T9 tempers. The –T8 temper has tensile strength of 58,000 psi; yield strength of 56,000 psi; elongation of 14%. In the –T9 temper it has tensile strength of 62,000 psi; yield strength of 61,000 psi; elongation of 10%. In either temper it offers up to 25% greater yield strength than any other standard screw machine stock alloy and is available at the same price as 6061-T6.

Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa

MORE DATA? Circle 62, inside back cover

Line of Screws Have Shank Insulated with Polyester Film

Fasteners called Sleev-Scrus consist of a metal screw whose shank is insulated with an integral cladding of Mylar polyester film which provides electrical insulation between the screw and the parts assembled with it. Unique feature of the screw is that the OD of the insulation is no greater than the OD of the thread.

The insulating film is thin with high dielectric strength per mil, yet has high thermal conductivity. Dielectric strength is up to 10,000 volts.

Pylon Co, Inc, 200 North Main St, Attleboro, Mass

MORE DATA? Circle 63, inside back cover

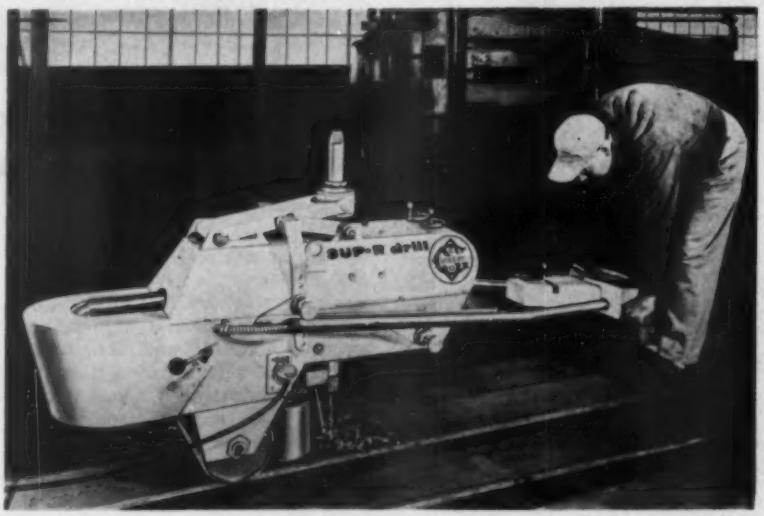
Portable Magnetic-Base Drill Has 1½-Inch Capacity in Steel

Portable drill for heavy structural shapes and other heavy metal drilling has a one-ton holding magnet in the base. It weighs 750 lbs and drills, reams, or countersinks up to 1½-in. dia holes or larger if an adapter is used. Only one operator is required. Drill has a 5-hp electric motor with a four-speed gearbox and a stainless steel body to resist corrosion and aluminum castings to reduce weight.

The unit, called Magnet Sup-R Drill, is said to perform work usually assigned to radial, wall gantry and other fixed installation drills. A typical job on 1-in. thick steel averaged 27 seconds per 1 1/16-in. hole.

Guibert Co, Pittsburgh 4, Pa.

MORE DATA? Circle 61, inside back cover



3M Introduces New Line Of Structural Adhesives

Scotch-Weld thermosetting film and one-part heat curing and two-part chemically curing liquid epoxy adhesives can be used to bond such parts as castings, tubing, gear and shaft assemblies, metal shipping containers and rotor blades.

Film adhesive provides room temperature overlap shear strengths up to 4200 psi with peel strengths in the range of 100 lbs per in. width. It has excellent resistance to water, oils, salt, fuels and 300 F dry heat.

The one-part liquid adhesive requires only contact pressure for curing and has shear strength to 5500 psi, fair peel strength and excellent resistance to water, oils, salt fuels and 300 F dry heat.

Two-part liquid adhesive also requires only contact pressure for curing, has 3200 psi shear strength, fair peel strength and excellent resistance to oils, fuels and 300 F dry heat. It requires weighing and mixing.

Minnesota Mining and Mfg Co, Adhesives and Coatings Div, 900 Bush Ave, St Paul 6, Minn

MORE DATA? Circle 64, inside back cover

New Branson Ultrasonic System Doubles Former Cleaning Rates

Sonogen Z ultrasonic cleaning system, more efficient for many applications than those using magnetostrictive or barium titanate transducers, is available in both high and medium intensity versions. Standard tank capacities range from 2 to 75 gal, consuming 150 to 2000 w.

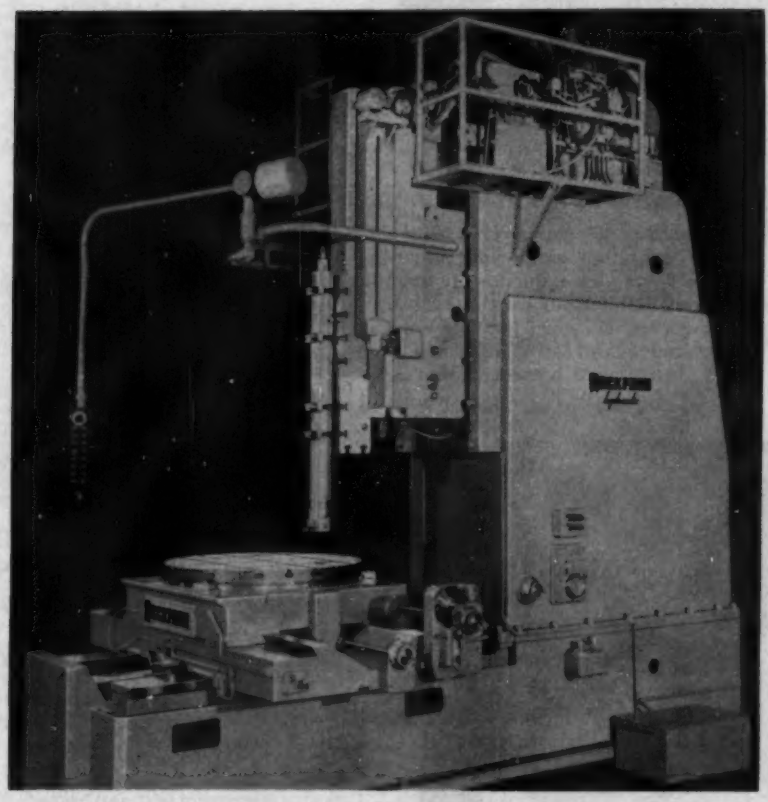
Heart of the new system is a sandwich-type lead zirconate titanate transducer designed to operate at 25 kc. Since it can convert larger amounts of power than barium titanate transducers used with 40-kc installations it may be operated as a full-wave system, doubling the effective power output per unit area. Because of the higher permissible input into the transducer system, cleaning rates almost double those formerly achieved are now possible with the same size equipment. Even the medium-intensity unit, using half as much power per unit volume, permits somewhat higher cleaning speeds than those possible before.

Advantages include extremely high efficiency, approximately 90% as compared with 70% for barium titanate; higher permissible operating temperature (200 F); ease of maintenance; flat tuning characteristics which reduce the necessity for close frequency control of the generator; and ability to accept higher electrical input power and convert it into mechanical energy. In addition, Sonogen Z elements may be completely reclaimed from a transducer housing which has deteriorated due to cavitation erosion. They are simply transferred from the worn housing to another, thus essentially fabricating a new transducer assembly.

The new system does not obsolete the 40-kc equipment currently being built by Branson; it is offered, rather, as a complementary line.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn

MORE DATA? Circle 66, inside back cover



Hydraulic Slotter With 36-Inch Vertical Stroke Features All Pushbutton Operation

SM 36-in. stroke hydraulic slotter features a counterbalanced pendant, operating through 240°, for pushbutton selection of longitudinal, rotary and transverse movements. No levers are needed.

Two-speed traverse is available to enable the operator to reposition the stroke, lengthen or shorten it directly from the pendant without stopping the machine. The ram is also locked from the pendant and is interlocked with the ram start and stop to prevent the ram from running when locked in position. The ram may be tilted from vertical to 10° forward.

A 40-hp radial piston hydraulic pump mounted on top of the column provides infinitely variable feeds and speeds. A built-in dividing head is provided for power indexing of keyways, serrations and gear teeth.

Rockford Machine Tool Co, Rockford, Ill

MORE DATA? Circle 65, inside back cover

Power Pack Permits Plating And Etching on Two Workpieces

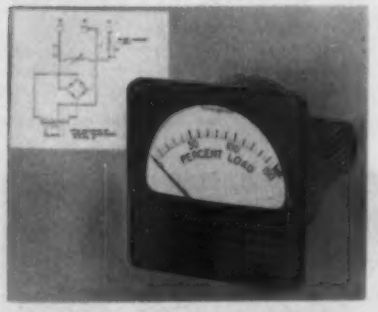
New Portable Dalic power pack has stepped-up current capacity for handling the rapidly-increasing volume of plating work in the machine tool, mining machinery, and marine engine fields.

The new unit operates on 220 volts, single phase, 60-cycles; it has an output of 0-50 amps at 0-30 volts with stepless voltage control and meter having 0.01 amp per hr divisions.

Two positive leads with plugs and two negative leads with clamps permit simultaneous plating and etching operations on two workpieces or a doubling of the amount of plating work requiring the same applied voltage and current density which can be performed in the same length of time. The pack is 32 in. high, 24 in. wide, and 18 in. deep. Weight is 227 lbs.

Sifco Metachemical, Inc, 935 E. 63rd St, Cleveland 3, Ohio

MORE DATA? Circle 67, inside back cover



Motor Load Indicator Accurate For Indication at Light Loads

New motor-load indicator (C-371) for use on either single- or three-phase, 50- or 60-c induction motors is now available from Westinghouse. The device is designed for use with a five-amp current transformer.

The instrument measures useful or working component of load current. An ac ammeter merely measures total current magnitude without respect to power factor. Since induction motors operate at different power factors, dependent upon load, this device gives more accurate indication at light loads, without sacrificing full-load indication.

The meter is calibrated for 190-280 volts, or for 350-550 volts. Two accessible resistor links permit operation of 190-280 volts. Indicator is housed in a flush-mounted case and may have either a four-inch square or a 4½-inch round mounting flange.

Westinghouse Electric Corp, P O Box 2099, Pittsburgh 30, Pa

MORE DATA? Circle 69, inside back cover

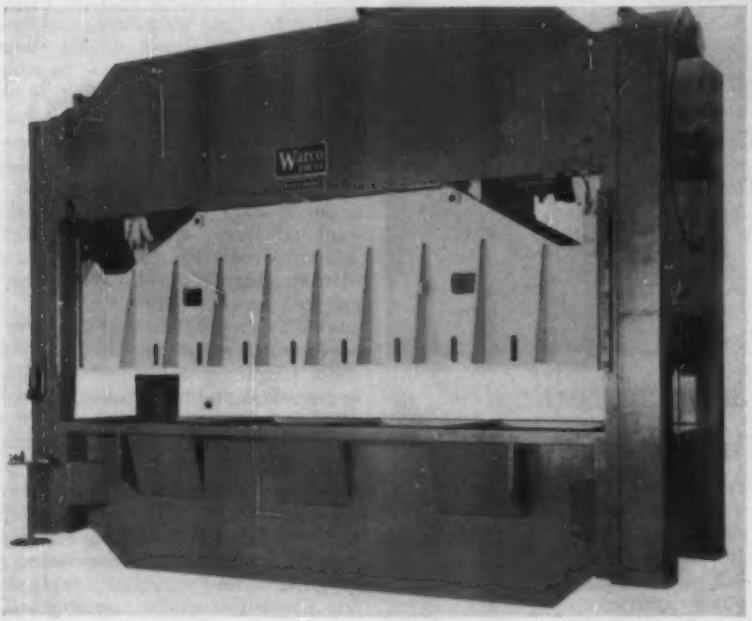
1600 C Tube Furnace Incorporates Kanthal Super Heating Elements

Model MTKS-312 vertical tube furnace has a 3-in. ID x 30-in. impervious Mullite tube with the Kanthal Super heating elements mounted vertically and parallel to its main axis. Hot zone is 12 in. long. Vertical-lift loading column is counter balanced for manual operation.

Heavy-duty all-welded steel case is insulated with 9½-in. graded superduty lightweight insulating refractory. Overall size is 30 in. wide by 30 in. deep by 60 in. high. Complete reactor package, strip chart indicator-controller-recorder, and required platinum thermocouple as well as internally wired controls are all mounted in a separate matching floor-type steel panel. Power requirements are 9 kw 220 v 60 c single phase.

Pereny Equipment Co, Chambers Rd, Columbus 12, Ohio

MORE DATA? Circle 70, inside back cover



WELDED STEEL, DOUBLE CRANK PRESS is double back geared, has twin drive, and is designed for side piercing and blanking aluminum. It has a speed of 30 spm and capacity near bottom of the stroke of 500 tons. Distance between housings to clear is 240 in. Area of slide is 72 x 240 in. with a stroke of 12 in. —*Warco Division, Federal Machine and Welder Co, Warren, Ohio*

MORE DATA? Circle 68, inside back cover

Adhesive-Coated Aluminum Foil Bonds to Plastics and Woods

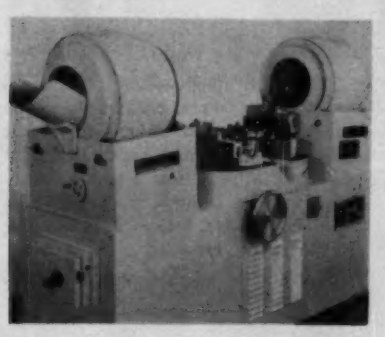
Aluminum foil, coated with an adhesive which bonds it permanently to plastics, plywood, and other wood products, may serve as a moisture

barrier, decorative element, base for paint, light reflector, strengthening agent, or a disperser of heat. One example of its use is protection of furniture veneers from cigarette burns. Bonding is accomplished under heat and pressure usually in a hot press.

Adhesive coating called Dri-Line, developed by Polymer Industries of Springdale, Conn, anchors extremely well to any aluminum surface. Since it will not adhere to any other substance or itself except under specific conditions of pressure, heat, time, and moisture, aluminum foil coated with the material can be shipped, handled, and stored safely for an indefinite period. Coated on one or both sides, foil is available in gages down to 0.001 and in widths up to 50 in.

Aluminum Co of America, 734 Alcoa Bldg, Pittsburgh 19, Pa

MORE DATA? Circle 71, inside back cover



Planetary Thread Rolling Machine Processes 600 Pieces per Minute

Model 125-A-24 planetary thread rolling machine rolls screws, bolts, and nails. Since it has two hoppers, users can run two different blank stocks simultaneously in lengths up to 3 in. and diameters up to 5/16 in. All work is class 3 fit and the machine is designed to operate one side at a time if desired. Other operations performed are roll forming, knurling, marking, serrating, and necking.

Features include: rear loading during production; two cradled hoppers with external drive, free of obstructions; end mounted vibrator; rapid adjusting feed-rail width; micrometer feed-rail positioner; expanding mandrel for truing die; and thin-wall ring die that can be set up in ten minutes to perfect concentricity, according to the manufacturer.

Prutton Corp., 5295 W 130th St, Cleveland 30, Ohio

MORE DATA? Circle 72, inside back cover

Planer-Miller for Huge Electric, Nuclear Workpieces Said to Be Britain's Largest

This 70 ft. long, 450 ton planer-milling machine is said to be the largest ever built in Britain and one of the biggest in the world. It was designed for machining huge electrical components and steam turbine casings for the nuclear power industry.

The maximum size of the component is 35 ft. 6 in. long x 12 ft. 0 in. wide x 9 ft. 6 in. high. Four milling heads, each powered by a 100 hp motor, are capable of operating with face milling cutters up to 3 ft in diameter. Columns are 24 ft. high.

Table and milling head traverses are controlled electronically to provide an infinitely variable range of feeds. Using an automotive type wheel the operator can steer the cutter around any shape of workpiece. The path steered by the operator automatically determines the speed and direction of the table and cutter head traverses.

Kendall & Gent Ltd. dist. by Sykes Machine & Gear Corp, 744 Broad St, Newark 2, NJ

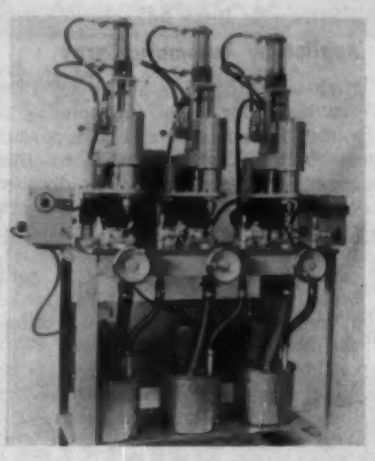
MORE DATA? Circle 74, inside back cover

Spindle Rippers Designed To Handle Tungsten Carbide Dies

Light and heavy duty automatic spindle rippers are available in single, double, and triple units (triple unit pictured). The unit is operated pneumatically, has time switches, and a new style head that can be adjusted for various sized dies and required pressure for adjustable cutting and ripping. Boron or silicon carbide is the cutting material, and an easy cleaning abrasive pumping unit is attached to each spindle ripper.

Dykrex Corp of America, Box 9022, North Station, Newark 4, NJ

MORE DATA? Circle 73, inside back cover



Walker-Turner Has Combination Belt and Disc Finishing Machine

New machine is capable of performing 90 per cent of all shop finishing operations, according to the manufacturer. The combination finishing machine, with standard 4-inch abrasive belt and 12-inch abrasive disc, was designed for use where custom or production finishing operations must be performed efficiently and economically.

Features include a 4¼ x 12 in. platen that can be inverted for underside general finishing or deburring operations on small, hard-to-handle parts; removable end guard to permit inside contour finishing operations on the idler drum; a 9¾ x 16¼ in. table. Price, without stand and motor, is $134.50.

Walker-Turner Division, Rockwell Mfg Co, 400 N Lexington Ave, Pittsburgh 8, Pa

MORE DATA? Circle 75, inside back cover

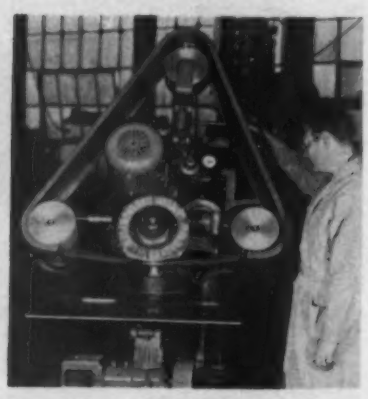
Elastomeric Base Adhesive Applied by Automatic Spray

High-strength oil-resistant EC-1390 has been developed for bonding a variety of porous and non-porous materials. Bonds produced by this general purpose industrial adhesive have high softening points and are reported to have excellent resistance to plastic flow. These properties, combined with rapid rate of strength buildup and good sprayability, make it well suited for volume production applications.

This adhesive, which may also be hand sprayed or brushed, produces high strength laminates with such materials as plastic, thin gage aluminum and steel, porcelain enameled steel, linoleum, leather, rubber, wood, composition board, and other materials.

Minnesota Mining & Mfg Co, 900 Bush Ave, St Paul 6, Minn

MORE DATA? Circle 76, inside back cover

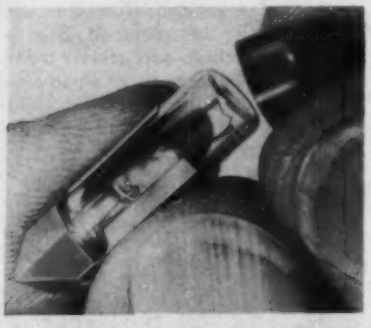


New Abrasive Belt Head Unit Designed for Polishing Contours

Model DLS, especially designed for polishing contours and equally suited for flat work, can perform both slack-belt operations and jobs requiring the backing up of the abrasive belt with a contact wheel or platen. Air cylinder maintains and adjusts belt tension on the tracking pulley; belt tracking is fast and positive through hand knob adjustment. Wide spacing between the two idler pulleys permits polishing of sharply contoured work since the abrasive belt has more opportunity to retrack itself. Belt length is 132 in. with width and horsepower of drive motor furnished to suit the application. Unit is available with various controls, accessories, and alternate arrangements.

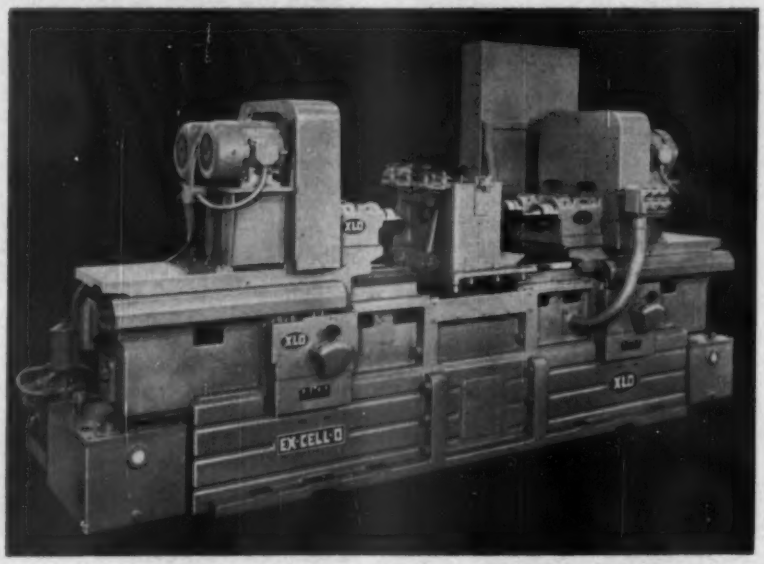
Divine Brothers Co, 200 Seward Ave, Utica, 1, NY

MORE DATA? Circle 77, inside back cover



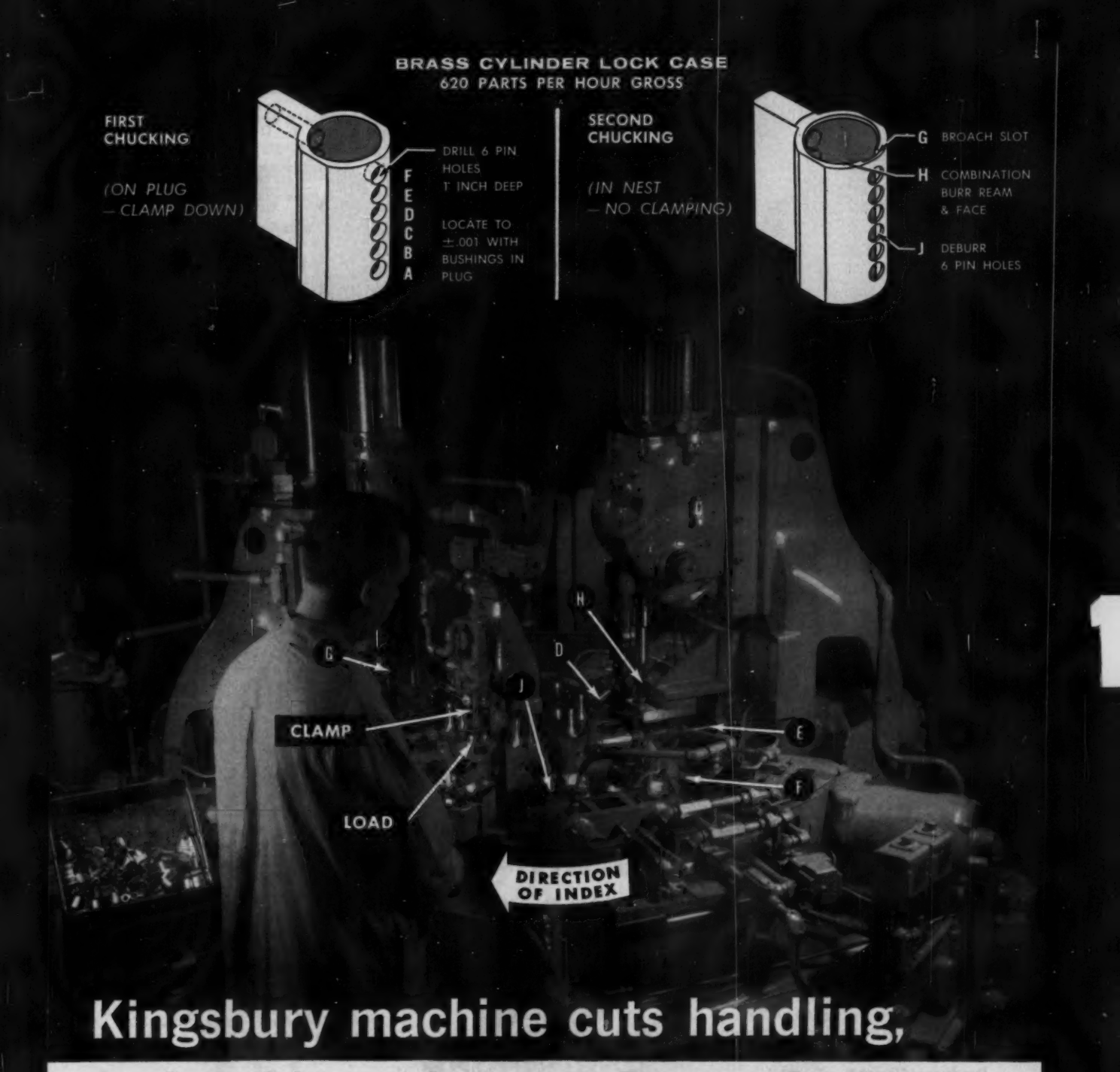
ELECTRONIC INDICATOR LAMP with rated life ten times greater than normal lamps is available with plastic color lamp caps, multi-socket strips for panel mounting, and single sockets. Volt sizes are from 4 to 28—*Sylvania Electric Products Inc, 730 Third Ave, New York 17, NY*

MORE DATA? Circle 78, inside back cover



TWO-WAY BORING MACHINE bores crankshaft and camshaft bearing diameters on air-cooled engine crankcases at a rate of 266 parts per hour. Tolerances are held to 0.0005 in. on camshaft hole diameter and 0.0003 in. on crankshaft hole diameter—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich*

MORE DATA? Circle 79, inside back cover



Kingsbury machine cuts handling, makes big savings on Dexter locks

"Too much handling of lock parts causes nicking and burring. Then the assembled locks bind and we have to rework them," says Dexter Industries, Inc., of Grand Rapids, Michigan.

"Our new Kingsbury has cut our handling way down, eliminating nicks and increasing production by combining several operations in two chuckings of the work. We're delighted with it."

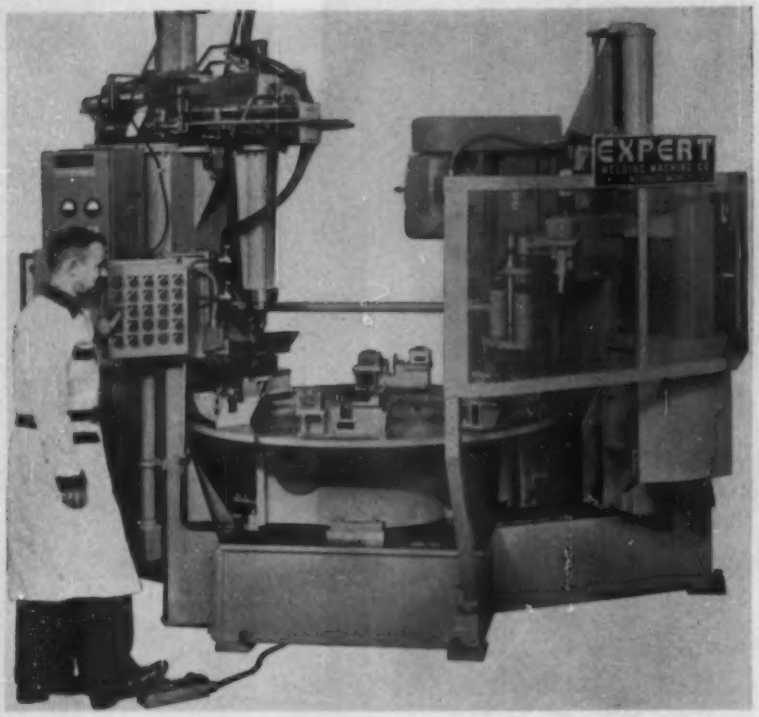
Each part passes twice around the machine. In the first chucking horizontal units at six stations drill the six pin holes, locating within .001. In the second chucking vertical units operate a broach and a combination tool. The last operation deburrs the pin holes; an air cylinder pushes removable pins on a block into the six pin holes.

Typical of what we can do for you. This setup resulted from the joint efforts of our sales engineers and representatives with Dexter's engineers and production men.

If you have drilling type operations in high production, may we make a proposal? Your Kingsbury will have good basic design and accurate rugged construction. It will be ready to produce when you receive it and will keep on producing. Kingsbury Machine Tool Corp., Keene, N. H.

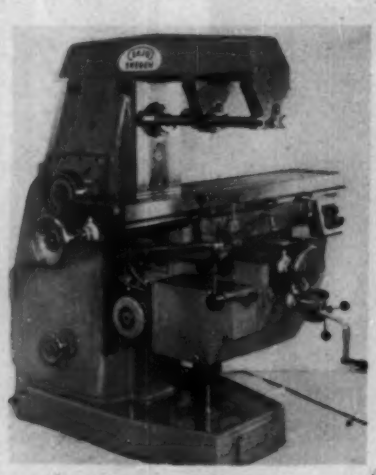
KINGSBURY MULTI-UNIT AUTOMATICS

CIRCLE 224 READER SERVICE CARD



SIX STATION ROTARY INDEX automated welding machine that combines assembly, CO_2 shielded arc welding, reaming, and spotfacing operations in the production of motor mount brackets has production rate of 360 parts per hour—*Expert Die & Tool Co, Inc, 17144 Mt Elliott Ave, Detroit 12, Mich*

MORE DATA? Circle 80, inside back cover



Production Milling Machine Features Automatic Cycling

Automatic cycling miller has been added to the SAJO (Swedish) line of knee-type horizontal and vertical milling machines. No 2 production miller, Model 54, offers selection of automatic table cycles, ranging from conventional one-way milling with return rapid traverse to skip-feed milling and continuous two-way milling with rapid traverse between cuts, with or without spindle braking.

Machine is fully automatic, the operator being required only to load and unload work. The automatic cycling arrangement can as easily be disengaged and the machine used for conventional operator-controlled milling when desired.

Automatic cycling feature is available on either horizontal or vertical models. Table size is 52 x 11 in., longitudinal power feed 33½ in., spindle #50 NMT, main drive motor 7½ hp, table feed and rapid traverse motor 1½ hp.

Austin Industrial Corporation, PO Box 430, White Plains, NY

MORE DATA? Circle 83, inside back cover

Drill With Mechanical Feed Produces Clean, Precise Holes

Line of air powered drills with mechanical feed is said to produce holes so clean and true that reaming is seldom necessary even in tough materials.

The unit consists of a multi-vane air motor powering the positive feed mechanism. The twist drill is automatically fed into the material being drilled at a predetermined rate until a pre-set depth is reached. Each drill unit has five rates of feed—2, 3, 4, 6 and 8 thousandths of an inch per drill revolution.

Mech-feed drills are available in 12 spindle speeds from 450 to 4500 rpm, two power ranges, straight or offset handles, and 0 to 5/16 in. chuck capacity.

Ingersoll-Rand Co, 11 Broadway, NY 4, NY

MORE DATA? Circle 81, inside back cover

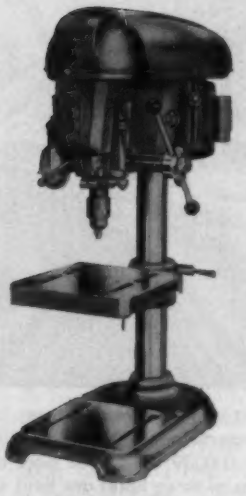
MOLDABLE CERAMIC tooling material suitable to 3000° F., called Duramic S-2, is readily molded using a slip casting technique in plastic molds. Technique consists of pouring a mixture into a mold, allowing it to set up in air, and giving it a low temperature bakeout—*Duramic Products, Inc, 426 Commercial Ave, Palisades Park, NJ*

MORE DATA? Circle 82, inside back cover

Micro-Wire Welding Process Introduced by Hobart

Micro-wire welding is an automatic process for carbon dioxide shielded arc welding of mild steel from 24 gage to ¼-in. thickness. It is named for the small 0.20 to 0.045 dia weld-

Cuts drilling time by 60%



Delta 15" Drill Press, also 20", 17", 14" and 14" Super-Hi Sensitive. Available in floor, bench, and multiple spindle models.

This substantial reduction in drilling time is the result of ingenuity plus a combination of Delta drill presses in two and three spindle set-ups. Spacing machines at a specified distance between holes and using bar connecting operating levers, Capitol Products Company provides *simultaneous* drilling in production of aluminum storm doors. The Mechanicsburg, Pa. firm has standardized on Delta drill presses because these tools assure the adaptability, ruggedness, and accuracy required. In addition, maintenance and servicing are greatly simplified.

Delta drill presses have set the industry standards for years —they cost less to buy, less to operate and less to maintain. Visit your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages)—choose the tool to fit *your* needs from the world's most complete line. For FREE Delta Industrial Catalog showing 61 machines, 302 models, over 1400 accessories, write: Rockwell Manufacturing Company, Delta Power Tool Division, 518-E N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ontario.

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE 225 READER SERVICE CARD

ing wire that is fed continuously from a spool into the weld zone. Equipment for the process includes a lightweight gun-cable assembly, wire feed unit, gas supply and regulation apparatus, and a power source of the constant voltage or variable slope type.

The process was developed for high speed welding of sheet metal in lighter gages not considered readily weldable by any other process. Another application is poor fit-up work such as the bridging of ¼-in. gaps on 14-gage mild steel. Advantages include high welding speeds in all positions with a minimum of distortion and little or no post-weld cleaning.

Hobart Brothers Co, Troy, Ohio

MORE DATA? Circle 84, inside back cover

Portable Arbor Press Develops 1500-lb Pressure

Arbor press for small assembly and fabricating jobs has a 500 to 1500-lb pressure range. It has a 4-in. stroke, 1-in. ram, 5½-in. throat and occupies a 10 by 13 in. space. Weight is 150 lbs.

For production applications, it is provided with automatic controls to synchronize with machine tools or assembly lines. It is also available with hand lever, push button or foot controls. Press is supplied with built-in hydraulic power unit and ¾-hp motor.

John S. Barnes Corp, 315 S Madison St, Rockford, Ill

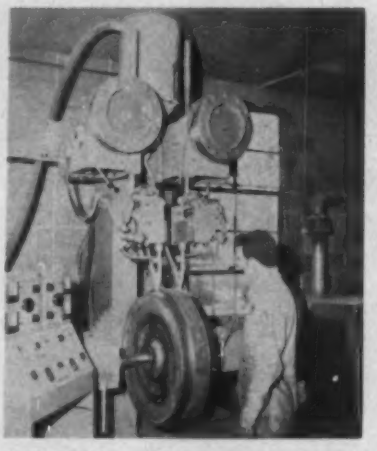
MORE DATA? Circle 85, inside back cover

Processed Mineral Clay Absorbs Oil and Grease

Oil Spunj, processed in granular form, soaks up oil, grease, chemicals and water; smothers flash fires; prevents slipping accidents. Spread ⅛ in. thick on wood, metal, or concrete floors, it stays on the floor until saturated, then is easily swept off. Advantages include extreme bulk per weight; high soluble oil retention; large floor coverage per pound. Free sample is available.

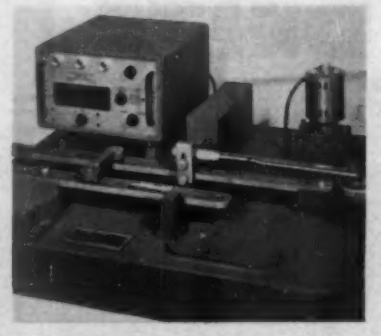
Canfield Oil Co, Cleveland 27, Ohio

MORE DATA? Circle 86, inside back cover



FULL-YOKE WELDER, Micro-Matic Model 7520-Y, is capable of handling hard-surfacing on rollers, idlers, and wheels up to 40 in. in dia—*Automatic Welding Co, Waukesha, Wis*

MORE DATA? Circle 87, inside back cover

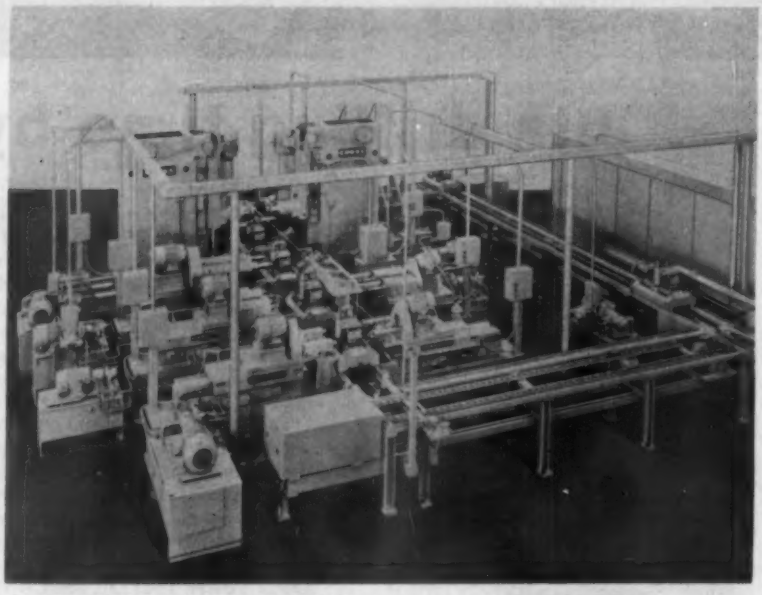


Torque-Wrench Calibrator Has 2000-ft-lb Capacity

Designed to load rapidly and read out the actual break-away value of torque wrenches of any design, the model TWC-139 torque-wrench calibrator uses a conventional proving ring as a load measuring standard. The digital counter translates the linear displacement of the proving ring into torque values with a calibration accuracy of 0.4% of full scale. It can calibrate torque wrenches with capacities from 20 in. lbs to 2000 ft lbs.

Steel City Testing Machines, Inc, 8817 Lyndon Ave, Detroit 38, Mich

MORE DATA? Circle 88, inside back cover



FIVE-STATION TRANSFER MACHINE processes cast-iron transmission cases for a small European automobile at the rate of 140 parts per hour. Twin milling operations establish over-all part length within ±0.0039 in. Some bore sizes ar held to tolerances of ±0.00035 in. and locations of three holes are held within ±0.001 in., each to both others. Fixture-pallet location is the key to close accuracy maintained. Pallets are forced transversely against two angular stops; a wedge, pushed in by a hydraulic cylinder, establishes longitudinal location and supplies clamping force—*Cross Co., Park Grove Station, Detroit 5, Mich*

MORE DATA? Circle 89, inside back cover

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Another report on Lehigh H tool steel—
"good machinability . . . very low distortion"

7-STAGE DIE FORMS AUTOMOTIVE DECK HINGE PART

This 7-position progressive die of Bethlehem Lehigh H tool steel was made recently by Hillside Tool & Die Company, Roseville, Michigan, for the production of an automotive deck hinge part, from 13-gage sheet steel. The die, made from Lehigh H supplied by our local distributor, Peninsular Steel Co., Detroit, was hardened to Rockwell C 60. It was used in a 400-ton press.

When asked about the performance of the tool steel, a Hillside engineer reported, "We like Lehigh H in jobs of this type because of its good machinability, and its very low distortion during heat-treatment. The die was placed in service with hardly any stoning necessary."

Bethlehem Lehigh H (AISI D-2) is our easy-machining, high-carbon, high-chrome grade of air-hardening tool steel. It has outstanding wear-resistance, due to its excellent carbide distribution.

Your Bethlehem tool steel distributor can give you full details on Lehigh H . . . and he has many sizes in stock.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Here's how to shrink-fit tool inserts

Shrink-fitting of tool steel inserts, commonly used in improving the service life of tools, is most applicable to rings and cylinders used in heading and drawing operations, where the tools can be shrink-fitted into large retaining rings. The shrink-fit sets up radial compressive stress in the tool. This serves to oppose radial tensile stress set up in service, thereby improving the performance over solid tools which are not pre-stressed.

Here's how to do it:

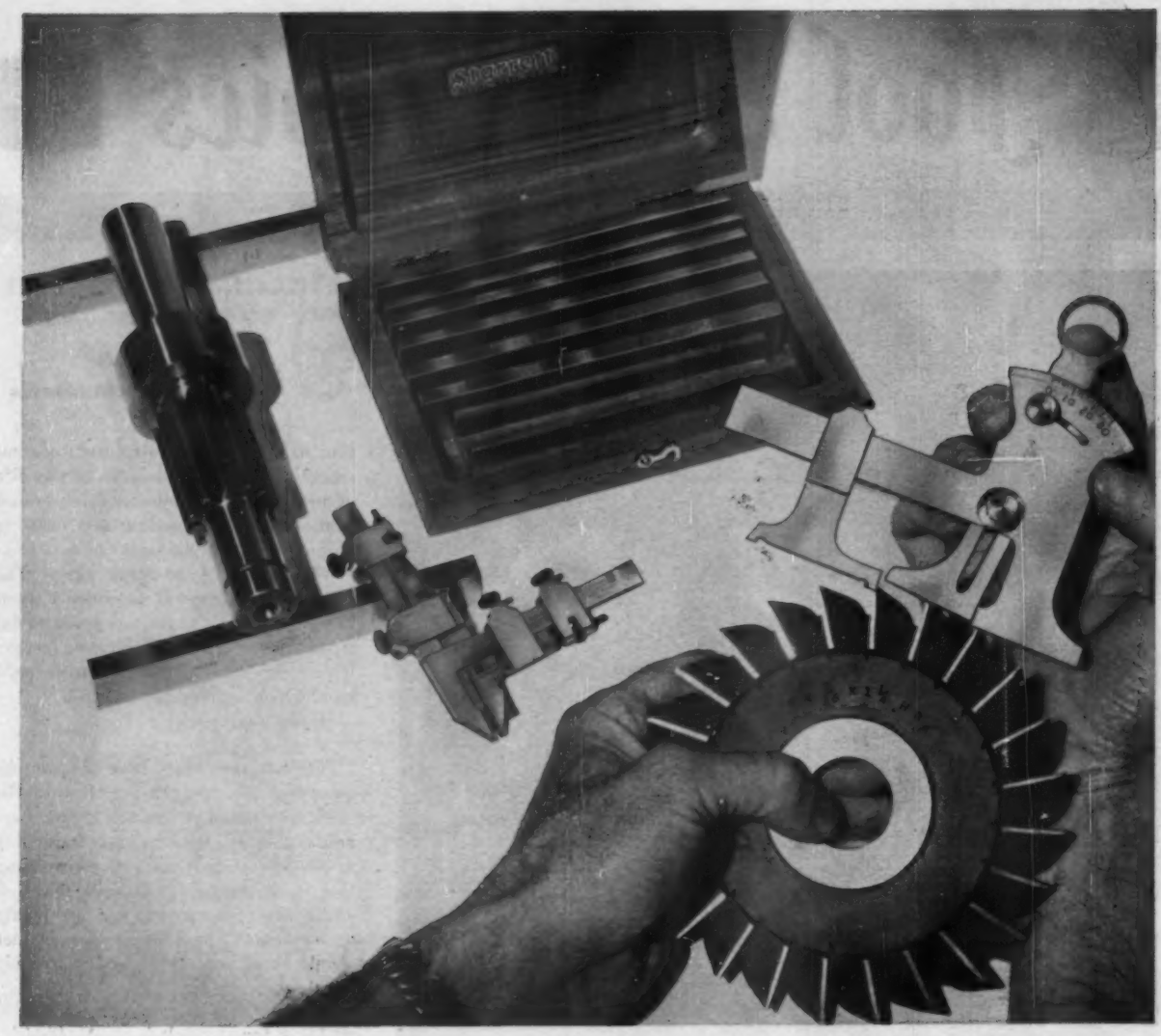
1. The retainer should have adequate diameter and strength to provide the stresses required on the tool insert. Generally, an alloy steel capable of hardening to 300-400 BHN is used. Shock-resisting tool steels, heat-treated to Rockwell C 48-52, are recommended for heavy-duty applications. The OD of the retainer should be at least twice, and preferably three times, the ID.

2. Allow for a shrink-fit of .003/.004 in. per in. Thus the OD of the insert is .003/.004 in. per in. larger than the ID of the retainer into which it is to fit. These dimensions must be maintained to obtain the benefits of shrink-fitting.

3. It is important that the OD of the insert and the ID of the retainer have a smooth finish, preferably produced by grinding.

4. Heat the retainer to a temperature sufficient to cause the expansion required in assembling the insert. Do not exceed the tempering temperature used in heat-treating the retainer. If necessary, the insert may be sub-zero cooled, to help provide the proper clearance for assembly.

5. After assembly of the parts, the assembly should be cooled rapidly. This will prevent over-tempering of the insert by heat transferred from the retainer.



These STARRETT tools step up toolroom and shop efficiency

A small investment in these Starrett tools will pay big dividends in hours saved and better work.

ELIMINATE GUESSWORK or the need for elaborate gaging equipment in cutter grinding with Starrett No. 459 Cutter Clearance Gage. Tells at a glance when cutters have the right clearance angle, insures best cutting efficiency in all milling and planer-miller operations. Checks all types of cutters from 30" dia. or more down to 2" and smaller — also slitting cutters, broaches, saws.

SPEED GEAR PRODUCTION and inspection with Starrett No. 456 Gear Tooth Vernier Caliper. Measures the chordal thickness and addendum of gear teeth — gives the answers in thousandths of an inch. Available in 20 to 2 and 10 to 1 diametral pitch sizes, also Metric.

SAVE ENDLESS TIME on inspection and layout work as well as on shop setups with Starrett No. 384 hardened and ground Steel Parallels. A set of four pairs is particularly recommended to provide a handy variety of sizes in a handsome, protective case.

Ask your nearby Industrial Supply Distributor to show you these and other Starrett tools designed for the toolroom and tool crib to speed and simplify precision measuring. Call him for quality products, dependable service . . . or write for complete Starrett Catalog. Address Dept. C, The L. S. Starrett Company, Athol, Massachusetts.

Starrett®

PRECISION TOOLS

World's Greatest Toolmakers

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

FIELD REPORT...

Michigan Tool's New Division

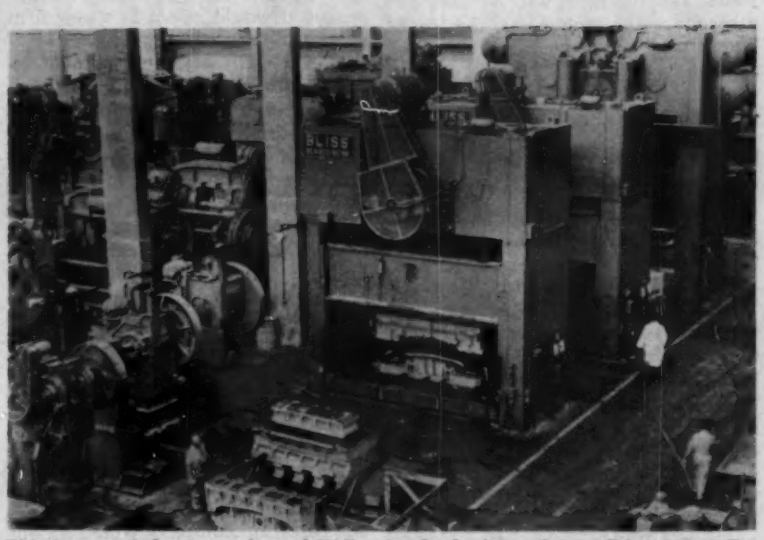
Michigan Tool Co, Detroit, has established a new division to provide complete facilities for production of high quality spur, helical, and bevel gears and splines for use in prototypes and in developmental quantities. The Enterprise Division has been formed by combining a number of previous facilities with newly acquired facilities of the former Enterprise Gear & Tool Corp of Detroit. Internal and external form grinding facilities were added recently through acquisition of gear grinding equipment and assets of Gear Grinding Machine Co.

Black & Decker Takes Over DeWalt

Entire capital stock of DeWalt Inc, Lancaster, Pa, a wholly owned subsidiary of American Machine & Foundry Co, is to be transferred to Black & Decker Manufacturing Co, Towson, Md, in exchange for 120,000 shares of B & D stock. DeWalt Power Shop saws for home workshops and its industrial radial saws will supplement B & D's line of portable power tools. Company will be operated as an independent subsidiary of Black & Decker; manufacturing, research, and engineering operations will continue at the Lancaster, Pa, plant.

Illinois Tool Builds Plant To House New Division

Facility is being constructed at Des Plaines, Ill, for Illinois Tool Works' new Conex Division that'll engage in production of the first line of consumer products for the company—plastic containers for dairy products, vending cups and containers for general household purposes. The new 73,000 sq-ft plant, scheduled for early fall occupancy and expected initially to employ 150 workers, will be the second ITW facility in Des Plaines.



This is part of the press plant of Willys-Overland of Brazil (an affiliate of Willys Motors Inc) where three larger Bliss presses, together with smaller Bliss inclinables, are used to produce the Aero Willys passenger car formerly made in Toledo, Ohio. The Willys plant in Sao Paulo is the largest body stamping operation in the world, outside of the US and Western Germany, producing Aero sedans, Jeep vehicles and, by special agreement, the French Dauphine passenger car

Company's Fastex Division was established there in 1952. Two expansion programs have doubled Fastex facilities but the plant is unable to house the rapidly growing packaging operations.

GM Adding Five-Acre Floor Space To Wilmington, Del, BOP Plant

Expansion and modernization program that'll add 250,000 sq ft of floor space to the General Motors assembly plant in Wilmington is being carried out on the existing plant site and will provide needed capacity for present and future production of Buicks, Oldsmobiles, and Pontiacs. No immediate increase in the number of units produced is anticipated, according to a company spokesman, but expansion will provide facilities for such increase when it's considered desirable. The plant occupies 135 acres and currently has floor space of 1,276,800 sq ft.

Ex-Cell-O Acquires Magna-Sine

The sine plate business of Omer E Robbins Co, Detroit, has been purchased by Ex-Cell-O Corp. Newly acquired products include a line of Magna-Sine magnetic sine plates or chucks as well as non-magnetic sine plates used for inspection work. Production and sale will be handled at Ex-Cell-O's Greenville, Ohio, plant.

US Orders $50 Million Worth Of Rockets from Lockheed

National Aeronautics and Space Administration has reached on initial agreement with Lockheed's Missile and Space Division for purchase of 16 Agena-B launch rockets at a cost of about $50 million. Deliveries

McGIRK'S WORKS

by GEO. CRENSHAW

IT'S LUNCH TIME, DRILLER BOY! WHY SO GLUM?
'CAUSE WEDNESDAY NIGHTS THE WIFE ALWAYS HAS THE GIRLS OVER FOR CARDS— AND THURSDAYS I ALWAYS GET HER REFRESHMENT LEFTOVERS IN MY LUNCH!
GEO. CRENSHAW
THAT SOUNDS REAL HUNGRY, MAN! WHAT'S WRONG WITH PARTY REFRESHMENTS?
SHE ALWAYS SERVES ICE CREAM!
MOE'S CORNER
I love these little surprises!

Field Report . . .

would be spread over the next three years. The Agena-B will be used as a second stage atop Atlas and Thor boosters for deep space and satellite missions.

Wiedemann Machine Takes Over Baldwin Testing Machines

The testing machine product line of the Electronics and Instrumentation Division of Baldwin-Lima-Hamilton Corp has been transferred to the Wiedemann Machine Co, King of Prussia, Pa. Transfer covers the physical testing machine business only; the Baldwin SR-4 strain gages, transducers, and associated instrumentation will continue to be marketed and manufactured on an expanded basis by the Electronics Div of BLH at Waltham, Mass. The testing machines will continue to be marketed under the Baldwin tradename and Wiedemann will carry on the business using the services of all key sales, engineering, and service personnel associated with the product line.

600 Engineers and Scientists . . .

. . . will be hired by Hughes Aircraft Co's ground systems group during the next nine months. Current work force at the Fullerton, Calif, facility numbers 6000 persons working on 26 military contracts involving more than $200 million. With the addition of the 600, weekly payroll will exceed $700,000. Hughes moved its ground systems operations to Fullerton from Los Angeles less than three years ago. At that time it employed 800 people and held five military contracts.

Howell Acquires Diehl Motor Line

Howell Electric Motors Co of Howell, Mich, has purchased the entire line of totally enclosed flat-type motors manufactured by Diehl Manufacturing Co, a division of Singer Manufacturing Co. The motors are primarily for such machine-tool applications as turret lathes, punch-presses, drillpresses, and milling machines but have many other uses where small size and light weight are major factors.

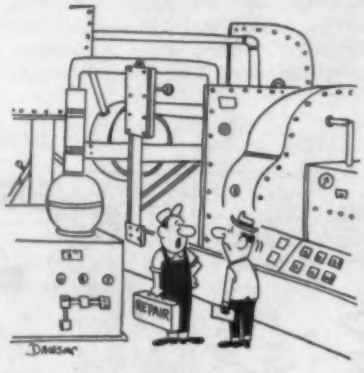
Temco Negotiating Merger With Ling-Altec Electronics

Directors of Temco Aircraft Corp, Dallas, and Ling-Altec Electronics Inc of Culver City, Calif, have approved revised terms for a proposed merger. Proposal, involving stock transaction, will be submitted to stockholders of both companies at a date yet to be determined; if approved it would result in a new firm to be known as Ling-Temco Electronics Inc. In a joint statement on the proposed merger, the two companies describe it as a major step toward their common objectives of developing into a leading, highly-diversified organization in the electronics and missiles industries. Combined sales in 1959 totaled $148.7 million with Dec 31 backlog of $133 million.

Ling-Altec products include environmental testing equipment for components of missiles, super-powered transmitters, and acoustical supplies. Temco, founded in 1945, has been diversifying from a straight airframe manufacturer into electronics, aerospace, and commercial ventures. It presently employs about 6000 and, if the merger goes through, the resulting company would be one of the Dallas area's biggest, with a payroll of around 9000.

Stromberg-Carlson's Digimatic Activities Moved to East Coast

All engineering, manufacturing, and marketing activities connected with the Digimatic line of numerical control systems for machine tools have been transferred from Stromberg-Carlson's Los Angeles facility to the company's Electronics Center plant in Rochester, NY. The staff of the Digimatic Numerical Control Systems Department is being reorganized in preparation for a campaign to market the systems to original equipment manufacturers in the machine tool field. John S Fondrk has been appointed general manager of the department. Western headquarters for field service and sales will continue in Los Angeles where a tape



"I'm afraid I'll have to take it to the shop for a few days."

This DoALL Announcement Also Appears in Newspapers

For several reasons we felt the news at right covering a substantial production breakthrough to be of such importance that the story should be presented in metropolitan newspapers.

We felt it our duty to remind the general public as well as people engaged in management and production of the fact that it is only through new and better tools that Americans can advance their standard of living. The *Super* saw bands developed for DoALL band machines are a bright new example of the basic truth: Economic and cultural progress comes directly through industry's application of the newest and best means to produce goods and services.

The average citizen needs a better understanding of how America's competitive enterprise system constantly supplies more of everything at lower costs by adopting the latest and fastest techniques. The DoALL Company pursues this policy through numerous additional efforts.*

***Typical DoALL Educational Projects**

"Civilization Through Tools"—our exhibit at the Museum of Science and Industry in Chicago—displays various types of basic tools and illustrates how living improves as a direct result of tool improvements during the Stone Age, Bronze Age, Iron Age and Machine Tool Age.

"The Dawn of This Age"—a second DoALL exhibit in Des Plaines, Illinois—dramatically explains how the manufacture and transportation of goods became the job of power-operated machines. An original James Watt steam engine and a model of the first machine tool are part of this exhibit.

"The Story of the Cutting Edge"—another touring exhibit on the evolution of metalworking. This is accompanied by a lecture on modern cutting tools and is illustrated with color slides.

"The Story of Measurement"—a further dramatic exhibit—shows the evolution of precision measurement. Technical material is available on modern quality control techniques.

Numerous study charts on the Machine Age are available for schools and industry by writing The DoALL Company, Des Plaines, Illinois.

CIRCLE 229 READER SERVICE CARD

Remarkable new tools benefit everyone!

This announcement of a galaxy of new *Super* DoALL band saw blades has unique importance for everyone. With much higher cutting performance and at lower costs, these new *Super* DoALL band tools generate another breakthrough for productivity and consequent higher living standards.

There are several types of new *Super* DoALL band tools. One of these is like a thin, endless broach—with insert tool points—ground on all cutting faces, which can be resharpened several times. Total life is many times longer than any previous band tool. Others have special multi-heat treatment processing which assures more accurate cutting with enormous increase in cutting productivity.

This new set of *Super* DoALL blades, added to the previous 18 styles of tools built for band machines, offers industry tremendous prospects for cutting manufacturing costs on a wide variety of products.

Three case histories reflect why "Each year the economy of the U. S. has been able to increase an average of more than 5% —more goods, for more people, at lower costs."

1. Take tractor parts; formerly cut with a hack saw, they cost $3.17 each. The factory plows back part of its earnings to buy an automatic DoALL Power Saw. The tractor parts then cost only $1.90 each. The end result: More food production for less money for everyone.

2. Manufacturing costs of wheel brakes for new jet airplanes were reduced by using a DoALL Band Mill, thus freeing more expensive machine tools for other jobs. This new method of manufacture results in enormous savings which help reduce air fares and thus make air travel possible for more people.

3. New miniature radios use transistors that were once prohibitive in cost. Then DoALL introduced new machine tools to precision slice wafer-thin the fragile semiconductor materials and with other developments the price of diodes and transistors dropped from $100 to as low as 50¢ each.

Multiply these examples a thousand times in thousands of factories and you have the reason for America's spiraling wealth which is the envy of the world.

DoALL is proud of its collaboration with industry — creating implements that increase productivity. When this company introduced the band saw as a machine tool, industry gained new concepts for lower cost manufacturing. Now any solid substance can be sliced directly to shape and dimension instead of chipping away the excess material. This new concept of continuous cutting with a narrow band tool also opens wide frontiers for machining new "exotic" materials.

While most manufacturers are already familiar with earlier DoALL machines and tools, new developments emerging from our Research and Development have raised production to astonishing new heights. Investigate these new production levels that are now possible with newest DoALL machines and tools. Factory-trained experts will demonstrate if you write or call.

New *Super* DoALL band tools

New Stainless Steel Gage Blocks

New Surface Grinder at only $1450

S8-84

Find Your DoALL STORE In The "Yellow Pages"

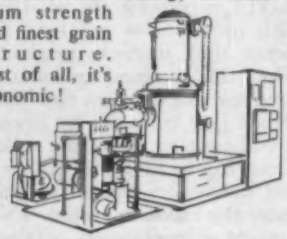
38 DoALL Sales-Service Stores in principal cities.

The DoALL Company, Des Plaines, Illinois

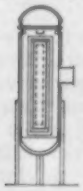
WESLEY R. GILBERT, Hayes Chief Engineer, tells about the . . .

"VACUUM AGE" OF HEAT TREATING

A major New York manufacturer of aircraft equipment recently reported their Hayes Vacu-Master Cold Wall Furnace was paying off in many ways — providing rapid cycling, simplified work handling, and complete production flexibility. Additionally, the vacuum furnace has eliminated need for atmosphere equipment . . . and produced work (stainless steel brazing) of maximum strength and finest grain structure. Best of all, it's economic!

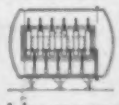


Similar Success Stories come to us from other users of Hayes Furnaces. Successful heat treating of "exotic" metals (tantalum, titanium, niobium, etc.) in the 2600 to 4500°F range. Successful sintering, hardening, annealing, and degassing at high production rates. Success stories all around!



The "Universal Atmosphere" has Universal Applications

Unlike other "atmospheres," vacuum has virtually no job limitations. Here's where the ingenuity of Hayes development engineers comes into play. By coordinating furnace design with job requirements . . . and by PROVING RESULTS in the Hayes lab . . . Hayes vacuum furnace engineers assure the customer a "RESULTS GUARANTEED" installation every time. I'd like to invite you to advance your heating into the "vacuum age" . . . with HAYES!



Write for vacuum Bulletin 5709A.

C. I. HAYES, INC.

Established 1913

837 WELLINGTON AVE. • CRANSTON 10, R. I.

It Pays To See Hayes for metallurgical guidance, lab. facilities, furnaces, atmos. generators, gas and liquid dryers.

Field Report . . .

preparation center is located serving users of control systems in that region.

Skinner Takes Over Horton Chucks

Skinner Chuck Co, New Britain, Conn, has acquired the Horton chuck line from the Geometric-Horton Division of United-Greenfield Corp, New Haven, Conn. Transaction includes purchase of tradenames and trademarks, machinery, jigs, fixtures, inventory, drawings, and patents of the Horton line, major portion of which is comprised of large size chucks up to 60 in. and a line of electric chucks, types and sizes not manufactured by Skinner.

Bay State Abrasive Products Buys West Coast Diamond Wheel Firm

Bay State, Westboro, Mass, grinding wheel producer, has purchased the Felker Manufacturing Co of Torrance, Calif, manufacturer of diamond abrasive cutting wheels used in industries including construction, marble and granite, building, ceramic, lapidary and electronic (crystal cutting). Company also manufactures machines and accessories used in these industries—cut-off, lapping, lapping compounds, and core drills.

R-O Manufacturing Co Sets Up Grinder Operation Training

R-O customers' grinder hands can be schooled in the fundamentals of R-O grinding at facilities provided in the company's new plant. Owners of R-O equipment can send a man to the training school at any time on pre-arrangement. Two fully equipped grinders, including the new R-O Comparator and all attachments, per-

"This last deduction was a stroke of genius, Hartley. One of these days we can eliminate take-home pay altogether."

Invented by **THOMSON**

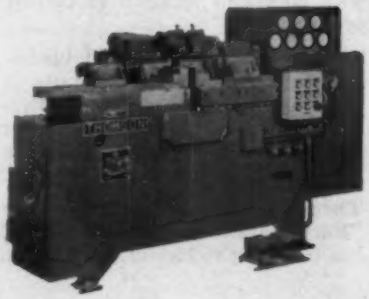
Perfected by **THOMSON** *Resistance Welding*

Spot • Projection • Seam • Press • Flash-Butt • High-Frequency

plus EXCLUSIVE

Synchro-matic and Synchro-shear*

. . . for jobs no other resistance welders can do



THOMSON QUALITY is so important that we build our own transformers to assure maximum performance and reliability. For all **AUTOMATED** and **HIGH-PRODUCTION** requirements — either special or standard design — **THOMSON QUALITY** is within your budget. A **THOMSON** quote will prove it.

* patented

Look for our nearest representative in the yellow pages or contact —

Inventor of Resistance Welding

THOMSON ELECTRIC WELDER COMPANY

161 PLEASANT STREET, LYNN, MASSACHUSETTS

LYnn 2-7710

CREATIVE COST CUTTING

Selecting the metal to fit the job can give you surprising savings in total cost

Small spring clips between telescoping parts of auto radio antennas must maintain electrical contact, hold parts firmly, give smooth sliding action. Brach Manufacturing Division of General Bronze Corp., Newark, N. J., found that spring clips of Duraflex®, Anaconda superfine-grain phosphor bronze, gave best positive electrical contact and improved smooth action in Brach Auto Antennas over original clips made of premium metals. The clips stand up in constant use, spot welding and fabrication are easier—and costs are about 25% lower.

In this G-E Automatic Coffee Maker control, a thermostat turns cam actuating switches—for high heat to brew coffee, for low heat to keep it warm. At first, upper switch element was an assembly of blade, bushing, and locking nut. Tinnerman Products Inc., Cleveland, Ohio, engineered a one-piece Speed Clip to replace it—by forming one thread in the blade and two prongs to lock the screw (see inset above). This simplification called for a superior phosphor bronze. Tinnerman found it in Duraflex, Anaconda superfine-grain phosphor bronze. It has higher tensile strength and endurance limit for long-lasting dependability—greater formability for economical manufacture. The result: unit costs were cut— and G-E assembles controls faster, more easily. 6045

Quality control and cost reduction can go hand in hand. The secret is often simply matching the metal to the job. And Anaconda specialists, starting with 93 standard alloys, can offer an almost unlimited number of combinations of useful properties. For creative help in meeting your problems, write The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA®

COPPER · BRASS · BRONZE

NICKEL SILVER MILL PRODUCTS

Made by The American Brass Company

You can't afford it!

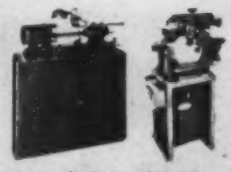
As the pictures show, taps cost roughly 6 times as much as drills. Yet it's common practice to resharpen the drill — and throw away the tap.

It doesn't make sense. And it's an awful waste of money.

That's where Blake comes in.

Blake makes low cost, high-precision tap grinding equipment. These easy operating tools can make your taps last up to 6 times longer . . . reduce work spoilage . . . enable taps to cut more accurately and uniformly with less strain . . . cut tap costs as much as 65%.

It's surprising how many people overlook this proven, basic method of saving money. Be sure you don't. Ask us for complete information.



Blake Chamfer Grinder/Blake Flute Grinder used in combination, create or restore:
1. exact indexing of cutting edges.
2. controlled rake angles for each job.
3. correctly ground spiral points.
4. perfectly relieved chamfers . . . make one tap do work of six!

EDWARD **BLAKE** COMPANY, INC., DEPARTMENT 11, 570 PLEASANT STREET, WATERTOWN, MASSACHUSETTS WA 6-0100

CIRCLE 234 READER SERVICE CARD

Easy Operation, Precision Measurements ...with Wilson "Rockwell" Hardness Testers

No matter what your hardness testing requirements are, there's a Wilson Rockwell instrument to do the job easily and accurately. Wilson instruments on the production line and in the laboratory offer these advantages:

Accuracy—Precision-built, with exact calibration, for consistently correct results.

Easy operation—Even an unskilled operator can get perfect readings. All controls conveniently grouped.

Long life—Simple design, rugged construction make Wilson instruments as durable as a machine tool.

Easy maintenance—Interchangeable mechanisms, with spindles mounted in oil-less bearings.

Complete line—Choose from the widest variety of instruments available, including semi and fully automatic models and Wilson "Brale" diamond penetrators.

Write for details—Ask for Catalog RT-58. It gives complete information on the full line of Wilson Rockwell hardness testers and accessories.

WILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-B Park Avenue, New York 17, New York

ACCO

Field Report . . .

mit simultaneous instruction of two trainees. The course is divided into 25 calculated steps and consists of approximately 17 hours of concentrated instruction over a two-day period. It covers setup and adjustments, methods of grinding a variety of tools, internal grinding, grinding of cams, squares, shapes, etc, use of accessories, and equipment service and maintenance. Cost of the two-day course is $100 per man; this includes transportation to and from the airport or station (trainees pay for transportation to and from Detroit), motel accommodations and meals. Further details may be obtained from R-O Manufacturing Co, 31171 Stephenson Highway, Madison Heights, Mich.

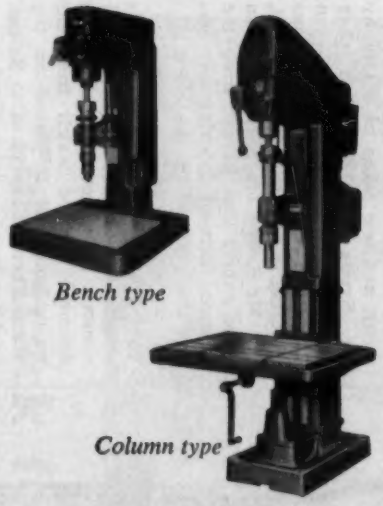
AiResearch Aluminum Foundry Available for Precision Casting

AiResearch's vertical centrifugal casting facility, reported to be the only one on the West Coast, and previously used exclusively for casting parts for its own products, is now available for precision aluminum casting of rotating equipment such as fans, turbine wheels, supercharger wheels, shrouded and unshrouded compressor wheels. Expansion of the foundry now permits it to compete for both defense and commercial contracts.

New Transistor Facility in RI

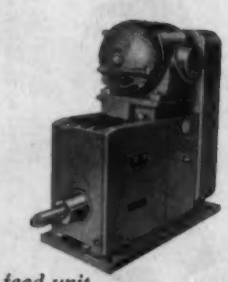
Amperex Electronic Corp of Hicksville, NY, a subsidiary of North American Philips Co, has purchased a 40,000 sq-ft plant and 17.5 acres of additional land at the Woonsocket Industrial Park in Slatersville, North Smithfield, RI, for manufacture of

"I've been looking for it so long I forgot what in hell I'm looking for!"

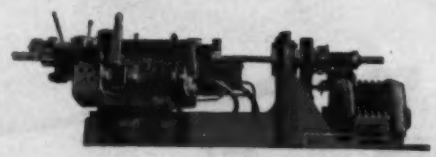


Bench type

Column type



Cam feed unit



Avey-draulic

Avey

drilling, tapping, production machines

The many features of our standard drilling and tapping machines can be combined in more than 100,000 different ways—and one of those combinations exactly meets your requirements.

Capacities in cast iron from very small numbered drills to 2"; No. 32 Jacobs chuck to No. 4 Morse taper.

Six or 8 speeds up to 12,000 rpm; 4 feeds.

Sharp reductions in unit costs, floor space, machine-handling time, and operating time often make our high-production machines smart investments with fast pay-off periods. They have repeatedly proved this in some of the finest automatic lines in the country.

Our standard units can be combined for either rotary or linear operations. They can be economically re-engineered for successive jobs.

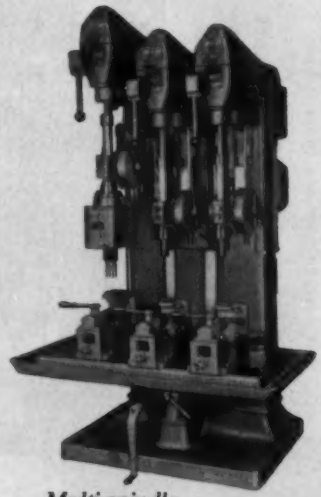
Avey has the right one for Avey makes them all

Column or bench type, with wide range of swing, 1 to 8 spindles.

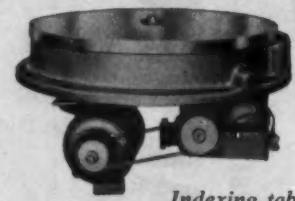
All of our standard drilling and tapping machines include such bonus features as micrometer stop collar, telescoping spindle guard, dynamically-balanced rotating parts, rack-and-pinion-operated motor plate, and our rugged, involute spindle construction.

Tool and die shops like the versatility, accuracy, and speed of our Tool Room machines. They're available with No. 2, 3, or 4 Morse taper. You select the table you need: large (34" x 25"), round (18" diameter), or compound (25" x 12").

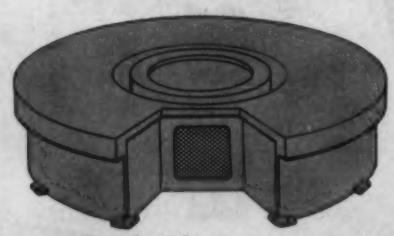
Ask for our literature; or, better yet, ask our representative to help you select the pay-off combination.



Multi-spindle



Indexing table



Standard base

Automatic cam feed units, for drilling, tapping, reaming, hollow milling. Vee belt or gear drive. No. 1, 2, or 3 Morse taper. Mount at any angle. Fully or semi-automatic. Tamper-proof.

Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Standard strokes 12" up to 30."

Automatic index tables. Rapid, accurate indexing to .001", 3 to 100 stations. Even or uneven index patterns. 16" to 48" diameter.

Steel bases. Stress relieved, sandblasted, machined, and painted to fit your application.

Send us a print of your part, and ask for a profit prediction.

AVEY DIVISION, THE MOTCH & MERRYWEATHER MACHINERY CO., BOX 1264, CINCINNATI 1, OHIO

at Arvin Industries, too...

FEDERAL-WARCO

High volume producers of precision metal products, Arvin Industries consistently get highest quality welds with Federal Multi-gun, automatic resistance welders.

Arvin quality control experts, like those of other leading metal fabricators across the country, know they can rely on Federal resistance welders and Warco mechanical presses to maintain quality and still meet highest production quotas. Precision-engineered to your requirement by:

THE FEDERAL MACHINE AND WELDER COMPANY
Warren, Ohio

Federal® WELDERS

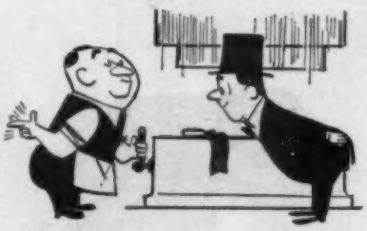
Warco® PRESSES

Federal #58W268 Multi-gun resistance welder in action on Arvin muffler parts.

transistors and semiconductor diodes. Production is scheduled to start Sept 1 and about 300 employees will be hired when full output is reached. Assembly lines will include a completely automated line for computer diodes and a semi-automated one for transistors. Initial transistor output is slated for the government but new lines are expected to be added.

MEMOS

by BESS RITTER



The wonderful precision of a machinist who is known to posterity by the name of "Fritz" only, and who worked for the Krupp Gun Works in the 1870's, is still remembered for an incident which occurred in 1877:

It seems that the Emperor William visited the Works in Essen, Germany, and was taken on a tour by Mr Krupp himself. When they paused to admire a great 50-ton steam trip hammer, Fritz, who was handling it, was introduced as well, and Mr Krupp bragged, "This man is so expert that he can drop the hammer without injuring any object that's placed on the block."

The Emperor immediately challenged this statement in a royal manner: He removed his expensive diamond studded watch from his pocket and had it placed on the block. Then he remarked to Krupp, "Set the hammer in motion."

The machinist hesitated, but the two men urged him on, with the exclamation, "Fritz, let fly!" He did, and the hammer dropped into position. It came so close to the watch that, according to the story, there wasn't room for a piece of writing paper to be placed between the timepiece and the hammer. Fritz was given the watch as a gift from the emperor, was given one thousand marks, as a gift from Krupp, and his name was engraved on the hammer.

ALLIS-CHALMERS

Rough-boring of fabricated steel low-pressure castings at Allis-Chalmers.

Test track for our own products

Experience in metal fabrication guides the design of products we offer you

Nobody understands the requirements of equipment for the metalworking industry better than people who are in it. As one of the world's largest metal fabricating companies, Allis-Chalmers sees first-hand how its own motors, control, pumps, and induction heaters perform under the severe everyday conditions of heavy usage, abrasive atmosphere and heat.

This experience with our own products lets us know their strong points . . . as well as the areas which might need greater improvement. It guides the design of our products in many ways . . . gives us operating results quickly . . . improves products with a realistic view of the actual conditions in the metalworking industry.

This system of proving Allis-Chalmers equipment and components in our own day-to-day "test track" is one of your greatest assurances of reliability, suitability, quality. *For further information call your nearby A-C distributor, representative, or write* **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wis.*

• • •

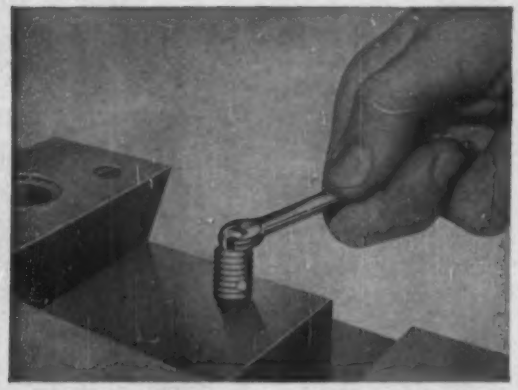
A-C products for the metalworking industry: Centrifugal and Vacuum Pumps, Compressors, Motors, Control, Valves, Induction Heaters, Rectifiers, Transformers, Switchgear, Unit Substations, Water Conditioning Systems, plus Material Handling Equipment.

A-1320

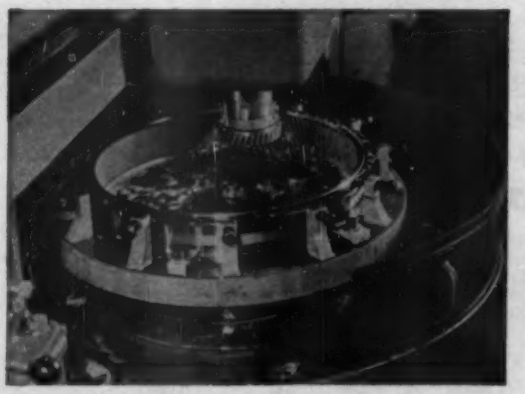
Practical Tooling Tips

No. 4 of a series

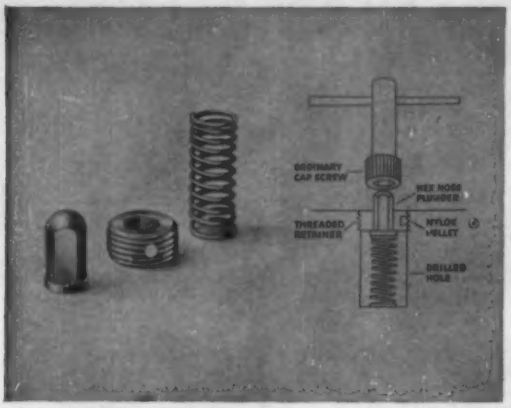
New uses are being found every day for Vlier Tooling Accessories. Perhaps the applications shown below will suggest ways you can profit by replacing costly, custom devices in jigs, dies and fixtures with precision, off-the-shelf Vlier products.



HEX NOSE SPEEDS INSTALLATION OF SPRING PLUNGERS—Vlier Hexnose Spring Plungers are easily installed with a simple end wrench. Eliminates hunting for special wrenches. Made to same exacting tolerances as Vlier Standard Spring Plungers. Available in many end pressures, diameters and lengths.



THIN-WALLED RING GEAR HELD SECURELY in fixture without distortion with 12 Vlier Torque Thumb Screws. Once pre-set end pressure is reached, knurled head spins freely, preventing overtightening. Checknut prevents backing off under vibration. Available in four types; various screw diameters and lengths.



NEW PLUNGER ASSEMBLY PREVENTS DAMAGE TO DIE STOPS—Plunger actuates automatic stop perfectly. Quickly installed, never needs adjustment. Hex nose mates with standard hex head bolts for easy insertion. Nylok® nylon pellet prevents threaded retainer from working loose. 8 sizes from ¼" to 1" diameter. Various end pressures.

FREE IDEA BOOKLET—Illustrations in this 16-page booklet show how others have profited from the use of Vlier Tooling Accessories. Shows both the usual and unusual applications. May suggest ways *you* can save. Write for your copy today.

VLIER
Engineering Corporation
A subsidiary of Barry Controls, Inc.
8900 Santa Monica Blvd. • Los Angeles 46, California

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 DRILLING MACHINES—*Lahr Machine & Tool Corp, 3400 Maplewood Ave, Toledo 10, Ohio.* 4-page folder illustrates and describes units with tape control for numerically controlled production. New designs include a heavy-duty single column turret drilling machine; six-spindle planer-type turret drilling machine; planer-type vertical drilling machine with automatic tool changer; and quill-type drilling machine with twin tilting tables.

2 VERTICAL BAND SAWING MACHINE—*DoAll Co, Des Plaines, Ill.* 8-page illustrated catalog gives details on the Band Mill, largest of the Contour-matic units, which is specifically designed for band machining heavy and large workpieces with a 2-in. Demon HSS saw band. Machine has a 26-in. throat, 24-in. work height, and a 52 x 44½-in. worktable with 48-in. usable travel. It is powered with a 10-hp variable speed drive.

3 MILLING MACHINES—*Index Machine Co, 543 N Mechanic St, Jackson, Mich.* Three 4-page bulletins provide data on the Model 60 plain horizontal unit with coolant system and automatic longitudinal power feed to table as standard, and eight speed changes from 50 to 1000 rpm; longitudinal feed 26 or 32 in. dependent on table size, transverse 10 in., vertical 16 in. Model 45 vertical milling machine has nine spindle speeds from 80 to 2700. Square design of sliding overarm assures that movement of overarm is always in the same plane. Longitudinal travel is 26 or 32 in., transverse or cross travel 10 or 12 in., vertical travel of knee 18 in. The Super 55 Model vertical milling machine has capacity of ⅛ to 1½-in. end mills in tool steel, 2 in. or more in milder steels or cast iron. Range is: longitudinal 26 or 32 in., transverse 9 in., vertical 17 in. Spindle speeds are 80 to 2700. Spindle design makes it possible to fly cut and then bore without danger to spindle bearings.

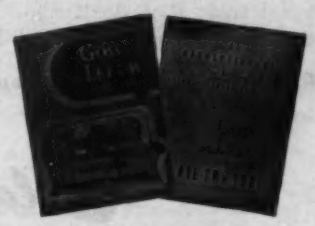
4 MILWAUKEE-MATIC — *Kearney & Trecker Corp, 6784 W National Ave, Milwaukee 14, Wis.* 16-page bulletin AP-60, "Around a Part in Just 8 Days," describes in pictures how a typical Mil-

"Hamilton, you lack self-confidence, but in your case that shows good judgment."

More Pieces COMPLETELY *finished in less time on* GOSS & DE LEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & DeLeeuw feature provides for finishing machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.



Send for illustrated literature which fully describes this recent Goss & DeLeeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

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It's easy to do when you let Columbus Die-Tool handle your special tooling problems.

Many leading companies all over the United States are now availing themselves of our creative engineering staff, modern plant and equipment, to design and build their special tools, jigs, fixtures and machines. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to your exacting requirements. Increase the efficiency of your operation with special tools that do the job better—faster—more economically . . . designed and made by Columbus Die-Tool.

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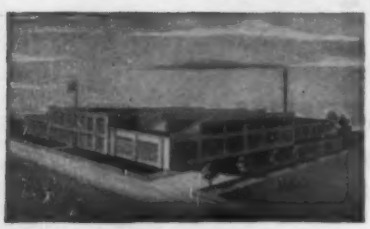


Designers and manufacturers of Jigs • Fixtures • Special Tools • Units for Machine Tools • Builders of Machine Tools Complete

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

waukee-Matic job was processed from print to finish-machined part (73 separate continuous machining operations) in eight working days. It compares conventional manufacturing methods with the Milwaukee-Matic system.

5 MILLING EQUIPMENT — *Dumore Co, 1300 17th St, Racine, Wis.* 6-page bulletin VM-60 provides information on three sizes of portable Versa-Mil equipment for milling, drilling, slotting, boring, shaping, grinding, and related machining operations on small, medium, or large work. Includes design features, specifications, accessories, and sample application possibilities.

6 SECONDARY OPERATION MACHINES—*Universal Automatic Corp, 9545 Ainslie St, Schiller Park, Ill.* 12-page catalog pictures and describes automatic high speed drilling, tapping, and threading machines and systems. Illustrates wide range of basic drilling operations which these machines perform.

7 MACHINING ALUMINUM ON AUTOMATIC SCREW MACHINES —*Kaiser Aluminum & Chemical Sales Inc, 919 N Michigan Ave, Chicago 11, Ill.* 13-page Operator Report covers properties of aluminum; aluminum screw machine alloys; cutting fluids; tools and tool life; chip breakers and chip curlers; general machinability ratings of aluminum alloys; tapping on automatic screw machines; cutting tool materials; aluminum quantity weight nomograph for screw machine stock; obtaining improved finishes; and machinability rating of aluminum screw machine stock alloys.

8 ITALIAN MACHINE TOOLS—*Mieal, Via Vittor Pisani 14, Milano 505, Italy.* 16-page catalog "Manufacturing Program 1960" illustrates and provides technical information on variety of machine tools including lathes in all ranges, universal milling machines, shapers, grinding and slotting machines, high speed metal saws, and radial drilling machines.

TOOLS AND ACCESSORIES

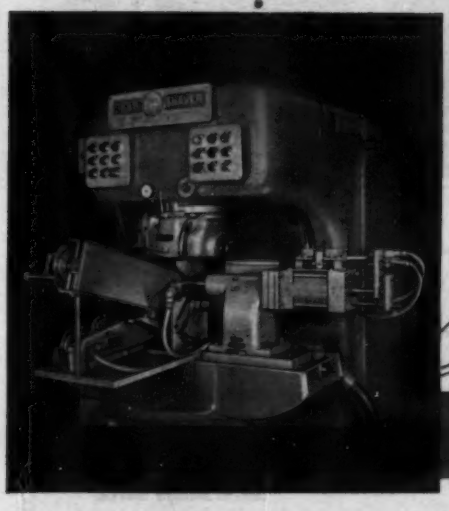
9 TOOLS — *Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill.* 68-page catalog 60 illustrates and describes with specifications and prices Double Circle tools including drills, reamers, end mills, countersinks and counterbores, carbide tools, bits, metric tools, lathe centers and mandrels, sleeves, arbors, gun drills, and special tools. Numerical and alphabetical indexes included.

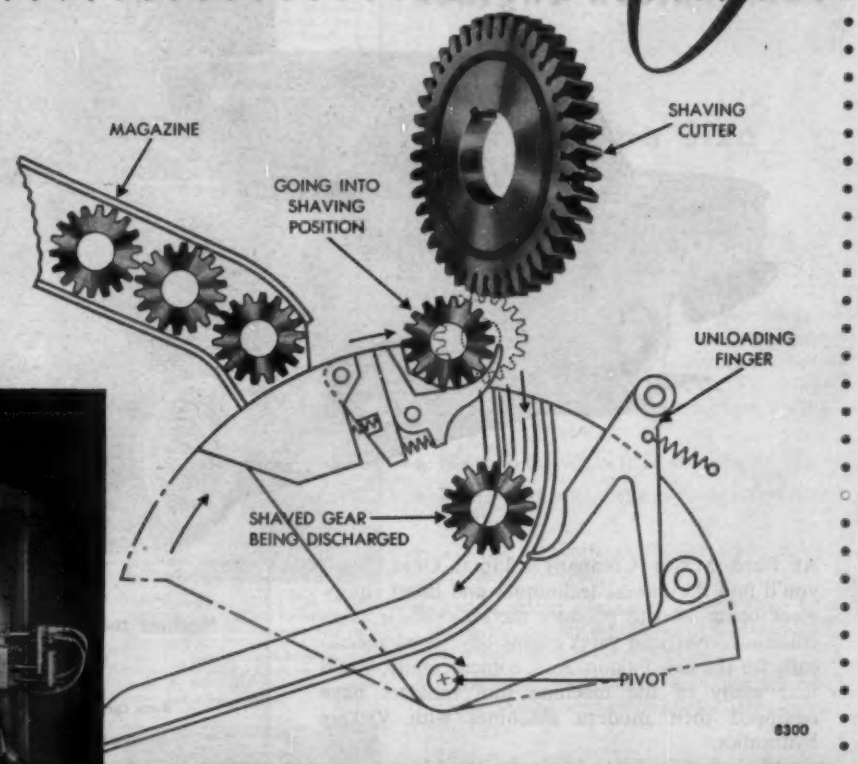
"I can't get by much longer on these starvation wages."

WHY SETTLE FOR ONLY **75%**

OF THE PRODUCTION YOU **CAN** GET WITH

AUTOMATIC GEAR SHAVING





RED RING ROCKER-TYPE AUTOMATIC LOADER
(PATENTED)

Production you can expect from automated gear shaving is determined by the type of automatic loader you use.

You get maximum production when the loader moves a gear from the magazine into shaving position and discharges its shaved predecessor — all at the same time. This assures maximum cutter operation.

If, on the other hand, the loading of a fresh gear has to wait until the previous gear has been discharged, shaving is delayed and you get only about 75% of the production you could otherwise expect.

The standard Universal Red Ring Gear Shaving Machine may be automated for MAXIMUM PRODUCTION — and without any major revisions in its design. Write for details.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Machine tools using VICKERS hydraulics maintain precision tolerances on Ford Falcon engines

At Ford Motor Company's Lima, Ohio, plant you'll find the newest techniques and finest equipment being used to produce the six-cylinder, high efficiency, overhead valve engine developed specifically for the new Falcon. And, coincidentally, you'll find many of the machine tool builders have equipped their modern machines with Vickers hydraulics.

Modern production equipment and Vickers hydraulics just go together naturally. Machine builders and users know these pumps, motors and control elements can't be beat in design features and quality of manufacture.

You get "extra" planning help from sales engineers who are hydraulic specialists responsible for the products of a single manufacturer. Skilled technicians who are always near at hand assure better service, too.

Get more details on the most complete line of modern industrial hydraulic equipment available anywhere by writing for Bulletin 5001C.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
DETROIT 32, MICHIGAN

8608

Machine tool builders using Vickers components at the Falcon engine plant

Apex Corporation
Bilt-Rite Tool Co.
Buhr Machine Tool Co.
Cen-Tor Division Centri-Spray Corp.
Colonial Broach & Machine Co.
The Cross Co.
Ex-Cell-O Corporation
Gramlee Bros. & Co.
Holcroft & Company
Industrial Metal Products Corp.
The Ingersoll Milling Mach. Co.
Kent-Owens Machine Company
H. R. Krueger & Co.
F. Jos. Lamb Co.
Landis Tool Company
LaSalle Machine Tool, Inc.
The R. K. LeBlond Mach. Tool Co.
Leland Detroit Mfg. Co.
Micromatic Hone Corporation
Morris Machine Tool Co.
The Natch & Merryweather Machine Co.
Snyder Corp.
Sundstrand Machine Tool Division of Sundstrand Corp.
Surface Combustion Division of Midland-Ross Corp.
Tocco Division The Ohio Crankshaft Co.
Turner Brothers
Wilson Automation Co.

Free Literature

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10 SLIDE CALCULATORS — *Adamas Carbide Corp, Kenilworth, NJ.* Set consists of a Carb-A-Guide card, a computer slide card, and a plastic container. Carb-A-Guide provides machinability ratings, grade of carbide to be used, and surface speed for various ranges of feed and depth of cut, plus hints on how to counter effects of edge wear and cratering. Computer Slide, a multi-purpose calculator, incorporates technical data on hardness conversion, speed conversion, milling feed rates, and horsepower.

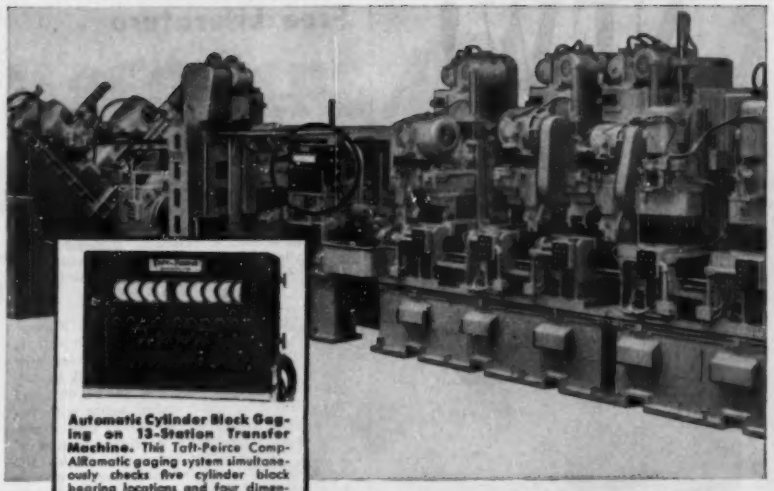
11 COLLAPSIBLE TAPS—*Landis Machine Co, Waynesboro, Pa.* 6-page bulletin G-94-2 provides information on ALT style taps available in five standard body sizes and 22 standard tap head sizes including two new head sizes which are adaptable to the 3 ALT tap body. Specifications included as well as tabular data on clearances, and design and operating features.

12 SOLID CARBIDE TOOLS—*Precision Carbide Co, 292 Belmont Ave, Paterson 2, NJ.* 16-page catalog and manual 59, in addition to descriptions and dimensions of boring and grinding tools, drills, end mills, and reamers, provides technical data such as recommended speeds for end mills, drills, and reamers, recommended lubricants, cutting speed conversion chart, and fluting chart for burs.

13 "A NEW LOOK AT GRINDING COSTS"—*Engelhard Hanovia Inc, 75 Austin St, Newark 2, NJ.* Article in Diamond Data, Vol 1, No. 2 provides a detailed plan for establishment of a grinding wheel evaluation program at the production level. While it deals principally with diamond grinding, the step-by-step evaluation methods discussed are easily applicable to other abrasive wheels.

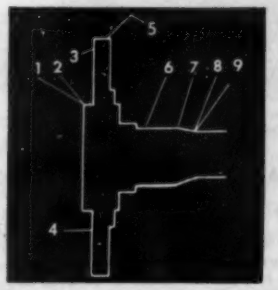
14 BROACHES AND BROACHING FIXTURES — *National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich.* 12-page catalog B60-4 discusses seven factors that are essential in a broaching tool and describes a wide variety of HSS and carbide broaches for holes, splines, irregular surfaces, flat surfaces, keyways, and serrations; special broaches also covered as well as self-contained air-powered broaching fixtures.

"I'll try to make it as brief as possible, Benton. No."

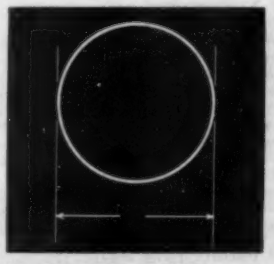


Automatic Cylinder Block Gaging on 13-Station Transfer Machine. This Taft-Peirce CompAIRamatic gaging system simultaneously checks five cylinder block bearing locations and four dimensions, with automatic shut off.

Simplify Production Line Size Control with Taft-Peirce CompAIRamatic Gaging Systems



OD, Squareness, Runout, Concentricity Tolerances: from .0005" to .003". Combines air-electric, standard air, and CompUtair air circuits to check five diameters, two runouts, one flatness, and one concentricity simultaneously on auto rear axles. Exclusive T-P CompUtair eliminates usual computations.



Size Control on Automatic Lathe. As parts approach tolerance limits, gaging unit sends electrical impulse to machine, which advances or retracts cutting tool to keep parts in optimum size range. If a part is produced outside the tolerance limits, unit shuts down the machine.

The Taft-Peirce *Velocity* air gage circuit is ideal for rapid production measurements — from simple diameters to complex multi-dimensional checks. It is an exclusive Taft-Peirce development providing these advantages . . .

- No time lag when used remotely.
- Fine sensitivity, rugged design and construction.
- Ability to accurately gage wide tolerances up to .125".
- Available in exclusive computing circuits for gaging a number of dimensional relationships — in one pass.
- Simplified "feed back" circuits for automatic size control or special signalling systems.

Whether your size control requires something standard or a brand-new gaging approach . . . Taft-Peirce CompAIRamatic Air-Electric Systems provide the combination of accuracy, flexibility, and ruggedness you need to cut costs and increase production.

Send for special Bulletin "Six Special Ways to Air Gage for Lower Costs, Higher Production." Let Taft-Peirce help you engineer new air gaging concepts — from single dial units to multi-dial air-electric units for fully automatic operations.

TPD-7

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TAFT-PEIRCE MANUFACTURING COMPANY
13 MECHANIC AVE., WOONSOCKET, RHODE ISLAND

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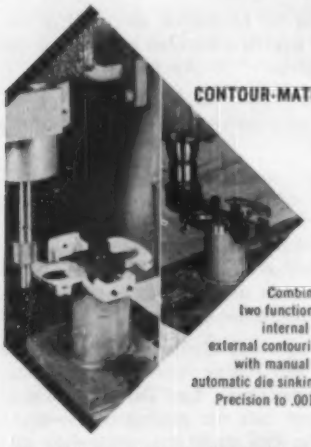
Simple, versatile, full-swing lathe coping attachment. By flip of switch use as standard lathe, for tracing, or thread cutting. Reproduction accuracies to .0005".

RECIPRO-MATIC

The first fully automatic die sink attachment. So automatic that one man can set up and run several machines. Infinitely variable feed rates.



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Combines two functions: internal or external contouring with manual or automatic die sinking. Precision to .001".

Any of these exclusive Turchan developments mount on your present machines. They'll put you on the track to low-cost precision tracer machining! Write or phone for full details.

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Free Literature

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15 LIGHT MEASUREMENT—*General Electric Co, Schenectady 5, NY.* 8-page bulletin GEZ-3005 on photovoltaic cells for the precise measurement of light offers complete description of these sensors for applications where light is used to perform a control function. Dimensions of all available cells, and typical circuits for single and multiple cell applications included.

16 TOGGLE CLAMPS—*Detroit Stamping Co, 330 Midland Ave, Detroit 3, Mich.* Bulletin 601-606 features three new models of plunger-type units added to De-Sta-Co line. Described are Model 601 and Model 601-0, a small clamp series with 95-lb holding pressure, and Model 606, a medium-duty clamp with holding pressure of 450 lb. Bulletin 102-105 covers Series 102 miniaturized vertical-handle toggle clamps and improved Series 105 horizontal-handle Tiny Toggles.

17 TEMPERATURE CONTROLS — *Assembly Products Inc, Chesterland, Ohio.* 12-page bulletin 108 covers inherently stable temperature control packages. Explains operation, circuitry, and safety features of the three basic types of thermocouple-actuated Simplytrols including the proportioning model that is capable of holding temperature of ±1 F of set point. Other types are the manual reset and automatic on-off controls.

18 METALLURGICAL LAB EQUIPMENT—*William J Hacker & Co, PO Box 646, West Caldwell, NJ.* Two reprints of articles are available—one, "High-Temperature Microscopy," by Prof Dr F Gabler and Dr W Wurz of Vienna, the other, by Gabler, "A Remotely Controlled Microscope for Hot Metallography."

HEAT TREATING AND WELDING

19 "VEST POCKET GUIDE TO BETTER WELDS" — *Hobart Brothers Co, Troy, Ohio.* 80-page booklet gives information on five essentials for proper welding procedures, examples of good and bad welds, welding positions, welding metals, causes and cures of common troubles, welding symbols, definition of terms, types of joints, correct electrode selection, comparative electrode index, typical deposition rates, automatic welding wires and flux, welding power sources.

20 AIRCOMATIC WELDING EQUIPMENT — *Air Reduction Sales Co, 150 E 42nd St, New York 17, NY.* 20-page catalog ADC 717F on gas-shielded metal-arc equipment covers complete line, both manual and automatic. New items included are the AH60-B Aircomatic manual gun for applications employing carbon dioxide as a shielding gas and two Aircomatic machine heads for production line welding. New accessory equipment includes the Fillerarc Rectifier power source; secondary contactors; and a line of flowmeter regulators for use with the Aircomatic process.

21 PRODUCTION CHILLING EQUIPMENT—*Cincinnati Sub-Zero Products, 3930 Reading Rd, Cincinnati 29, Ohio.* Bulletin illustrates and describes large capacity equipment for stabilization of metals, stress relief of castings, dehydration of gases, expansion assembly, and similar applications. Temperature ranges are available to —150 F and thermal capacities from 500 to 10,000 Btu per hr.

22 CARBON ARC WELDING—*Arcair Co, PO Box 431, Lancaster, Ohio.* 12-page instruction manual describes operation and use of the Arcair twin electrode carbon arc welding torch. Applications illustrated and discussed.

23 SELENIUM RECTIFIERS — *Miller Electric Manufacturing Co, Appleton, Wis.* 10-page booklet covers such points as stack construction, ratings, cell sizes and characteristics, duty cycle, efficiency, overloads, selenium vs other rectifiers.

PLANT SERVICE EQUIPMENT

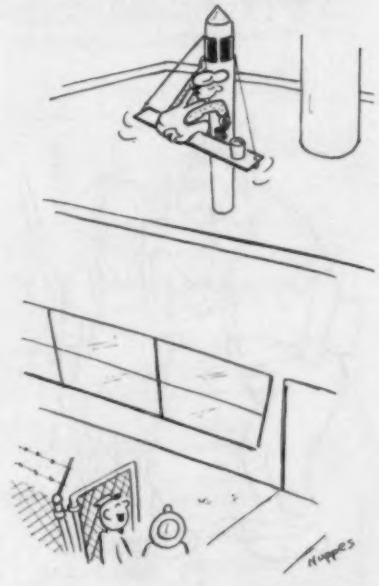
24 INDUSTRIAL PRODUCTS—*American-Standard Industrial Division, Detroit 32, Mich.* 24-page bulletin B-5529 illustrates and gives brief description, including basic ratings, of complete line of air conditioning and air handling equipment, fluid drives, heat exchangers, surface condensers, steel boilers, and related products made by the division.

25 FORK LIFT TRUCKS—*Allis-Chalmers Manufacturing Co, Engine-Material Handling Division, Box 512, Milwaukee 1, Wis.* 2-page catalog BU-481A pictures and describes features of UL approved gas, LP gas, and diesel units in 2000 to 10,000-lb capacities. 2-page bulletin BU-638 covers Safety diesel lift trucks in 3000 to 8000-lb capacities.

26 HOIST STANDARD SPECIFICATIONS—*Hoist Manufacturers Association, One Thomas Circle, Washington 5, DC.* 6-page booklet "HMA-300 Standard Specifications for Manually Lever Operated Chain Hoists" contains tables and recommended minimum standards on hoists of ratchet and pawl design and load brake design using roller or link coil chain.

27 DIE HANDLING TRUCKS—*Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio.* 6-page illustrated folder contains specifications for Elpar die handling vehicles available in capacities from 6000 to 120,000 lb. Platform specifications, truck heights, weight, and turning space are charted. Four basic types include push-pull, side and end loading, winch, and the new fifth wheel type.

28 COOLANT FILTRATION — *Commercial Filters Corp, 2 Main St, Melrose 76, Mass.* 4-page illustrated bulletin reviews applications and operation of the CFC Delpark Filter-Matic designed for machine tool coolant filtration where heavy contamination in liquid-solid separation presents a problem. Filter-Matic handles flow rates up to 1000 gpm, is automatic, self-cleaning.



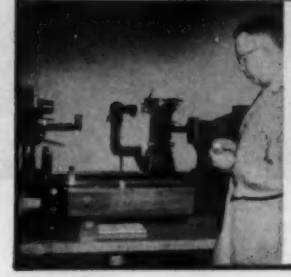
"Watch that guy painting the whistle! It's just about quittin' time!"

HOW ADAMAS HELPS *Mack* BUILD TRUCK PARTS THAT LAST FOREVER

Cross section

Unique, patented carbide-faced valve lifter boasts "never wear out" performance!

AT MACK—ultrasonic inspection equipment of the resonant-frequency type is used to insure the absence of flaws after the tungsten carbide discs are bonded to Mack's Durafaced valve lifters. Following a special electrolytic treatment which trues up the tungsten carbide working surface, a probe is placed over the disc and the condition of the unit registers on the cathode ray tube.



AT ADAMAS—using the latest metallographic equipment; Jack Powers, Supervisor of Metallography, submits the tungsten carbide discs to a microscopic examination, the final step prior to shipment. Rigid laboratory tests include: chemical analysis of powders, grain size checks, Rockwell hardness, density (weighed to .0001 grams) and transverse rupture strength of sintered pieces.

• Mack's exclusive Durafaced® valve lifters are faced with specially formulated Adamas tungsten carbide discs, .060 in. to .070 in. thickness, furnished ready for application.

A secret patented process is used to bond the tungsten carbide discs to the valve lifters. The discs, unmatched for uniformity of quality, contribute to the peak operating efficiency of the Mack Thermodyne® diesel and gasoline engines!

The flatness of the valve lifter face is held to 0.0005 in., permitting only a slightly crowned surface with a finish of 5 rms. The Adamas tungsten carbide discs, manufactured under precise quality control procedures, have a hardness of 89 ± .5 Rockwell A.

Mack reports that valve lifters protected by Adamas tungsten carbide discs have shown no evidence of wear after hundreds of thousands of miles of service.

If you are looking for durable, dependable and economical carbide products to meet your specific conditions—specify "Adamas"! For product information or sales engineering assistance, write to:

Producers of Tungsten Carbide Tools, Tool Tips, Dies, Wear Parts, Cut-A-Tool

ADAMAS CARBIDE CORPORATION
KENILWORTH, NEW JERSEY

PROGRESSIVE CARBIDE USERS SELECT BY *Performance* ... NOT HABIT!

VERSATILITY

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WT ALKER-TURNER

20″ drill presses

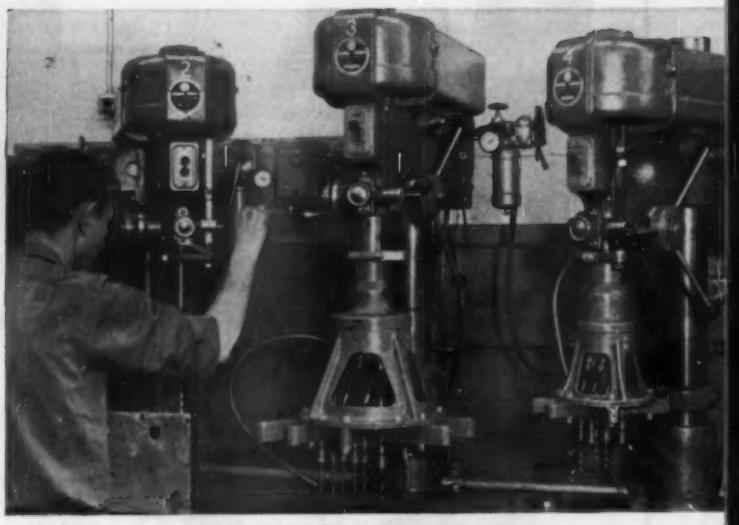
You want the most efficient set-up for every job —*now* and when your production requirements change. That's where Walker-Turner "Light Heavyweight" 20″ drill presses can really pay off. These fast, rugged, accurate tools cost far less than many single-purpose machines—yet can do the same work when used as components in standard or semi-automated set-ups. They can be adapted, quickly and economically, to handle *hundreds* of applications. Built to withstand years of heavy duty wear, W-T drill presses offer lower maintenance costs, save you money in reduced operating expenses.

Your Walker-Turner Distributor (listed under "TOOLS" or "MACHINE TOOLS" in the Yellow Pages) is thoroughly familiar with all phases of metalworking. He'll gladly show you the full line of Walker-Turner 20″, 17″, 15″ and new 14″ Hi-Speed drill presses—in floor, bench and single or multiple-spindle models. See him soon for money-saving ideas and tools.

For **FREE CATALOG** of the complete line of W-T metalworking tools, write: Rockwell Manufacturing Company, Walker-Turner Division, Dept. WE-21 400 N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ont.

WALKER-TURNER
"LIGHT-HEAVYWEIGHT" MACHINE TOOLS
another fine product by
ROCKWELL

2 Spindles—drilling and tapping



3 Spindles—multiple hole drilling (2 speeds)

24 Spindles—sequence operations

CIRCLE 247 READER SERVICE CARD

Heald Machine Co, Worcester, Mass, subsidiary of Cincinnati Milling Machine Co, has elected **Lawrence H Cousineau** (left) president to succeed **Carles F Roby** who has retired. Mr Cousineau, who is administrative vice president of the parent company, will continue to serve in that post. **Hartwell G Howe** (center) has been appointed vice president and general manager to succeed **Carl M Beach.** Mr Beach is relinquishing his duties for health reasons and will return to Cincinnati Milling. **Glenn C Moore** (upper right) assumes Mr Howe's duties as domestic sales manager. **Charles H Munsey** (lower right), formerly general manager of Heald Ltd, Birmingham, England, takes over from Mr Moore as export sales manager

NAMES IN THE NEWS...

Motch & Merryweather Machinery Co, Cleveland, has elected **Alvin J Jones** and **D M Hallier** vice presidents of the company. Mr Jones, formerly director of engineering and manufacturing, will be manager of the Machine Tool Manufacturing Division at the Euclid plant. Mr Hallier is manager of the Cutting Tool Manufacturing Division and the Allied Products Division.

Chrysler Corp has elected **W C Newberg** president and chief operating officer. Formerly executive vice president, he succeeds **L L Colbert,** named board chairman, chief executive officer, and chairman of the finance committee.

Ford Motor Co has appointed **D J Bracken** general manufacturing manager of the Ford Division to succeed **Ward A Folsom** who is retiring from the company after a 34-year career in the automobile industry. Mr Bracken has been assistant general manufacturing manager since Ford and Lincoln-Mercury Division manufacturing operations were centralized last November.

American Society of Tool and Manufacturing Engineers has elected **H Dale Long,** president and board chairman of Scully Jones & Co, Chicago, president of the Society. Other officers elected: **William Moreland,** vice president of F E Myers & Bro Co, Ashland, Ohio, 1st vice president; **David A Schrom,** works manager of the York Division of Borg-Warner Corp, York, Pa, 2nd vice president; **Philip R Marsilius,** vice president of Producto Machine Co, Bridgeport, Conn, 3rd vice president; and **Frank F Ford,** president of Ford Supply Co, Atlanta, Ga, 4th vice president.

Douglas Tool Co, Detroit manufacturer of jigs and fixtures and special machines, has appointed **John P**

E W Bliss Co, Canton, Ohio, has appointed **A S Burgoyne,** formerly vice president, manufacturing, to the new position of vice president and manager of the company's Press and Die Supply Division

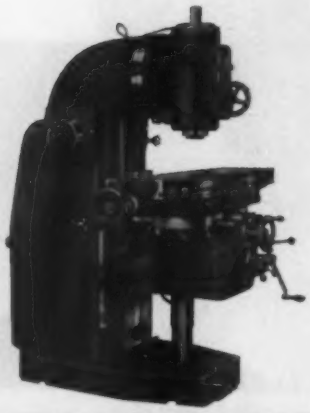
Ohio Crankshaft Co, Cleveland, has elected **A H Schott** vice president. He will continue as general manager of the Crankshaft and Camshaft Division

Vickers Incorporated, Detroit, has elected **Merrill A Hayden** a vice president. He was formerly general manager of the Machinery Hydraulics Division

POWER PERSONIFIED
SAJO No. 2 Vertical Miller

Just a glance at this rugged machine confirms its ability to perform with ease the most demanding jobs. Sajo's swiveling head, power feed to quill and unrivaled spindle construction combine versatility with unsurpassed tool room accuracy.

Also available —
Horizontal Millers
Plain and Universal



No. 2 Vertical Miller
table size: 52" x 11"
7½ and 11½ HP motors
rapid power traverse

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CIRCLE 249 READER SERVICE CARD

MSO
Since 1865

FOR MORE PROFITABLE GRINDING

For toolroom or job shop this MSO Universal Grinder with 7" x 12" capacity is unexcelled in sensitivity, accuracy, finish.

MODEL FMES
a true Universal Grinder
with compound swivel
wheelhead
fine in-feed to .00005"

Whether for toolroom or production, MSO offers a complete line of precision grinding machines with features such as:

Automatic cycling
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NAMES IN THE NEWS . . .

Vederko vice president and general manager. Mr Vederko, who joined Douglas in 1959, was formerly general manager of the London, Ont, plant of Ex-Cell-O Corp of Canada Ltd.

Capewell Manufacturing Co, Hartford, Conn, has elected **William C Heard** vice president, sales. He will continue to direct the national sales engineering staff

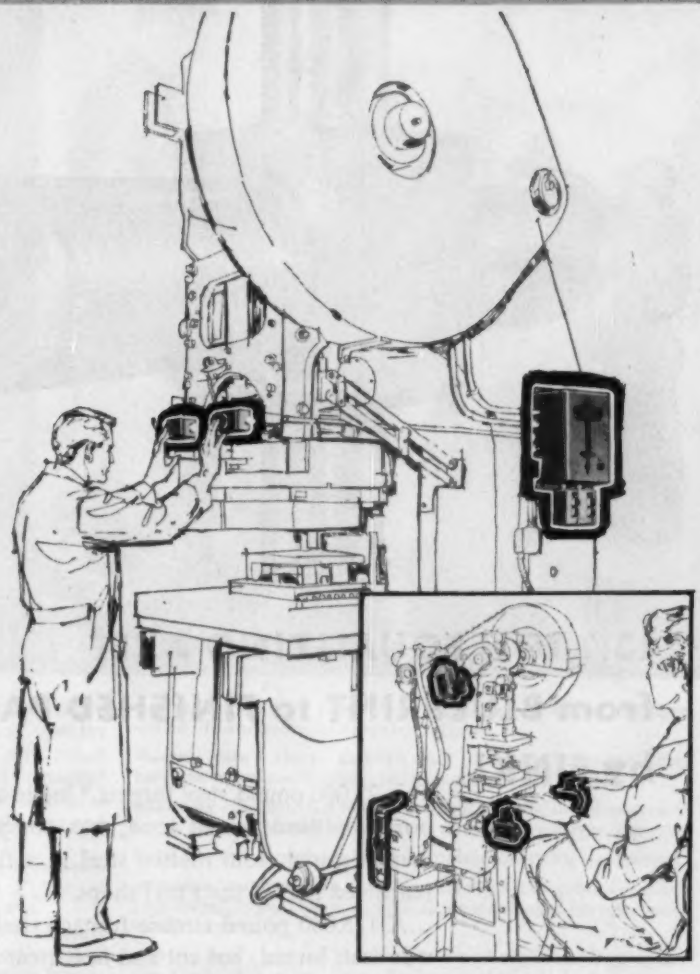
General Motors Corp has appointed **Louis M Millon** to the newly created post of general manufacturing manager of the Ternstedt Division. **Edmund T Henry,** resident manager of Ternstedt's Trenton, NJ, plant, succeeds Mr Millon as resident manager at Flint. **Louis J Grimaldi,** works manager at Flint, takes over Mr Henry's former post, and **Robert J Heusel,** Flint production manager, has been promoted to works manager there.

Garrett Corp has appointed **Harry Wetzel Jr** supervising vice president for five of its divisions. Vice president Wetzel, who is manager of the AirResearch Manufacturing Division at Los Angeles, is now also supervisor of manufacturing activities for AiResearch Manufacturing Division of Arizona, AiResearch Industrial Division, Los Angeles, Air Cruisers Division, Belmar, NJ, and Garrett Manufacturing Ltd in Canada.

New York Air Brake Co, Kalamazoo, Mich, has appointed **W Gordon Jarvis** manager of manufacturing of the Hydreco Division. Mr Jarvis has been associated with Hydreco for the past five years in various executive capacities in sales and production control. **Russell K Annis** has been named manager of engineering at the Aurora Pump Division. He was formerly chief engineer at the Kansas City works of Fairbanks Morse.

MICRO SWITCH Precision Switches

Why you should not have a punch press without MICRO SWITCH TRIP CONTROL



Packaged Kits . . . Low in Cost

Trip Controls from MICRO SWITCH start as low as $60.00 and are packaged in six simple, easy-to-wire models that fit virtually any punch press or paper cutter.

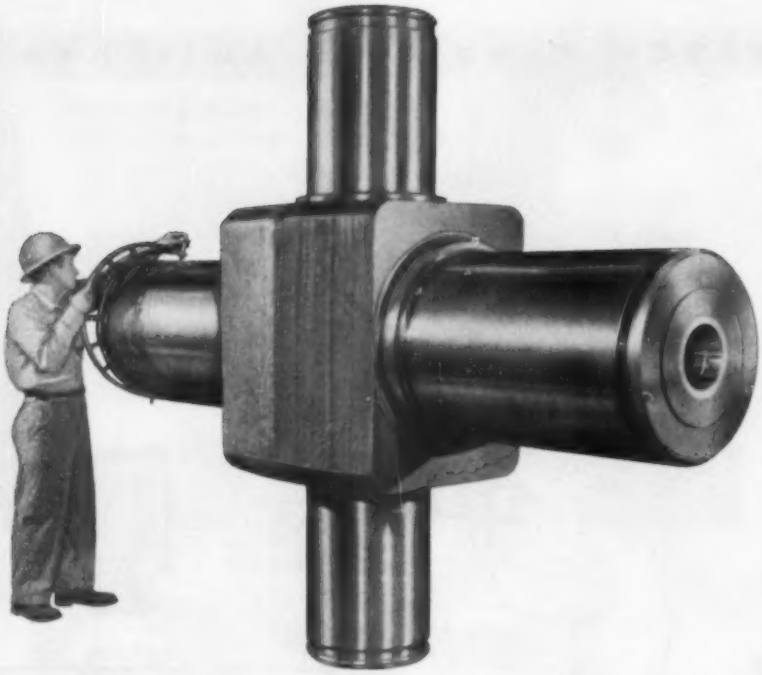
1. **You can increase production.** It's a matter of dollars and cents. Productivity of small bench presses as well as large OBI's will jump when Trip Control is installed. Finger-tip actuation of precision electric switches cuts operator fatigue, keeps production up even at the end of the day. Simple, direct operating motions let the operator continue a smooth, productive work rhythm. The switch does the work, particularly important in replacing awkward or heavy lever action that causes fatigue.

2. **TRIP CONTROL can't be cheated—even for the first stroke!** An exclusive feature of the MICRO SWITCH Trip Control is the "Can't Cheat" feature. It absolutely prevents the dangerous condition of an operator tying down or wedging one switch and then operating the control with one hand. Unlike other systems, Trip Control will not allow even one stroke under these conditions. An exclusive "Fail-Safe" feature prevents an accidental actuation of the clutch due to a faulty or damaged control component. Another exclusive protects die setters and maintenance men—and expensive dies—during set-up.

Ask about actual cases where Trip Controls increased production and raised employee morale. Your nearby MICRO SWITCH *branch office is listed in the Yellow Pages. Or write for revised Catalog 65.*

MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls Limited, Toronto 17, Ontario

Honeywell
MICRO SWITCH Precision Switches



13½ TON EQUALIZING AXLE from BLUEPRINT to FINISHED PART by FINKL

This 27,000 pound steel forging,* made to support a million pound load, was completely manufactured from molten steel to a finished machined part in the Finkl shops.

A 115,000 pound electric furnace steel ingot was cast, forged, hot cut and heat treated, followed by hundreds of hours of rough and finished machining. Then the square section was heated to accept the horizontal part to complete the shrinking operation to make this equalizing axle.

Finkl is well-equipped to engineer and produce a wide range of forged parts . . . our sales engineers will be pleased to talk to you about your forgings, hot work steels and die block needs.

*Replaced a casting

DIE BLOCKS · FORGINGS · HOT WORK STEELS · ELECTRIC FURNACE STEELS

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largest forgings in the Middle West

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BOSTON • LOS ANGELES Warehouses in: CHICAGO • DETROIT • BOSTON • LOS ANGELES

NAMES IN THE NEWS . . .

Fafnir Bearing Co, New Britain, Conn, has appointed **Stanley G Fisher** general sales manager. Mr Fisher was formerly vice president and general sales manager of Landers, Frary & Clark, New Britain appliance manufacturer.

Gisholt Machine Co, Madison, Wis, has announced the retirement of **Howard V Myers** after 25 years of association with the company. Mr Myers has headed the Chicago territory sales office since 1949.

P R Mallory & Co, Indianapolis manufacturer of electrical, electronic, and special metallurgical products, has elected **G Barron Mallory** president to succeed **Joseph E Cain,** named co-chairman of the board. Mr Mallory was formerly administrative vice president.

Snyder Corp, Detroit, has named **John J MacDonald** service manager. Formerly service engineer for special machine tools and automated machinery, he succeeds **Charles J Kraft** who has been made Snyder machine assembly supervisor.

Macco Products Co, Chicago manufacturer of lubricants, drawing and forging compounds, and other chemical compounds for metalworking, has named **Frank A Gall** Illinois district manager.

OBITUARIES

William R Moore, 69, former **Norton Co** vice president, died recently in Clearwater, Fla, where he had lived since his retirement in 1956. He had been associated with the company for 42 years, 13 as vice president.

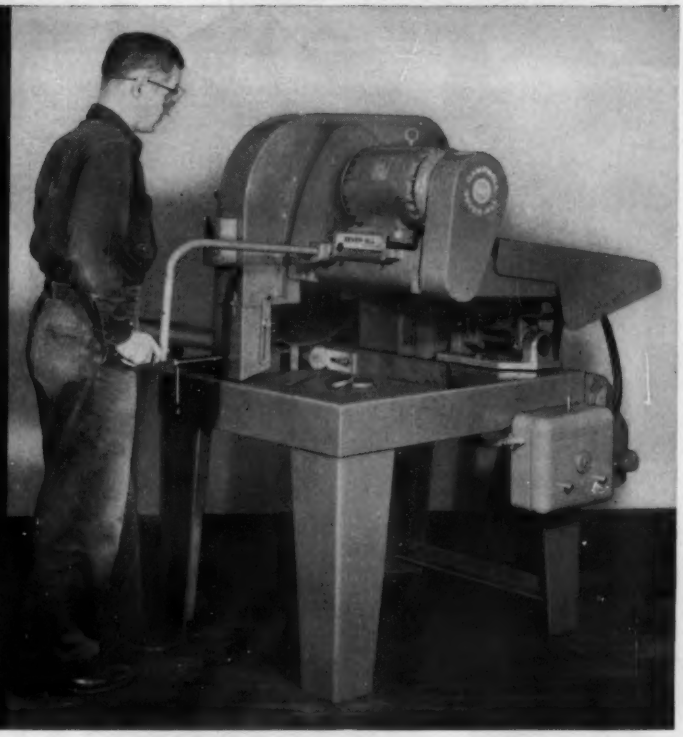
Augustus Silliman Blagden, 80, chairman ofthe **Federal Machine & Welder Co** of Warren, Ohio, died May 10. He joined the company in 1945 as an adviser to management, was elected president in 1949, and board chairman in 1957.

William J Greene, former vice president and director of sales of **L S Starrett Co,** Athol, Mass, died April 26.

Joseph M Redinger, 87, president of **Thurston Manufacturing Co,** Providence, RI, and a veteran designer of metal-cutting tools, died April 25.

NEW!

GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4″ round or square solids, 6″ diameter tubing or standard pipe, 6″ x 1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

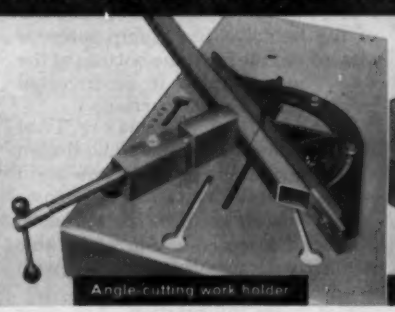
Safe • wheel guard provides complete operator protection.

Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

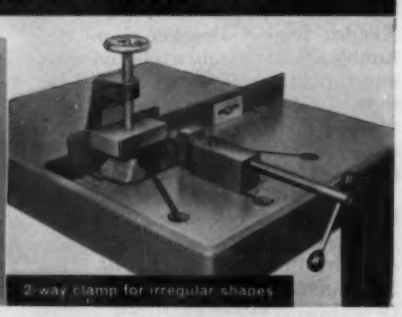
Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp



Angle-cutting work holder



2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

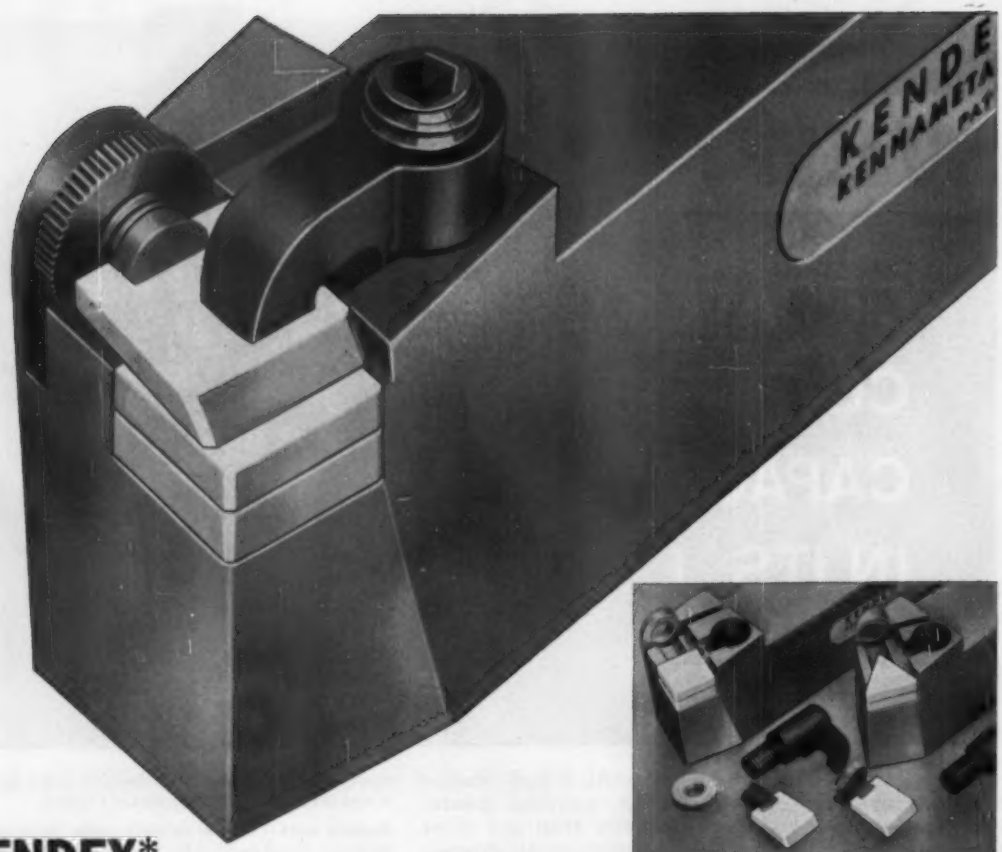
***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

ACCO

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

923 Connecticut Avenue, Bridgeport 2, Conn.



Holders illustrated with clamps and chipbreakers removed show positive seating of both triangular and square inserts. When not required, tool may be used without chipbreaker, with clamp set directly on the insert.

NEW KENDEX*

DIAL-A-BREAKER

Easily adjustable . . . attached chipbreaker

Quickly, easily . . . set the chipbreaker where you want it, regardless of holder position. The new Kendex Dial-A-Breaker eliminates fumbling and fussing while changing and adjusting chipbreakers and inserts. Chipbreaker is brazed to its adjustment screw. *It can't fall out, and the breaker setting may be retained while indexing or changing inserts.*

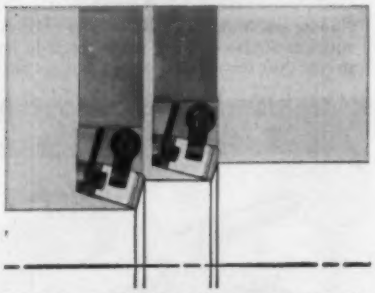
You no longer need a different breaker for every cutting job. Now you just turn the dial and position one chipbreaker for *several* jobs. Minimum of parts to stock . . . only two chipbreakers required for 70 styles and sizes of holders.

Close ganging of tools presents no adjustment problems with the Kendex Dial-A-Breaker. *All* changes and adjustments . . . chipbreaker and insert . . . can be made from the top of the holder. (The clamp screw is also accessible from the bottom of the tool when mounted in an inverted position on the rear carriage.)

Kendex Dial-A-Breaker Tool Holders have the same basic design and accommodate the same solid Kennametal shims and "throw-away" inserts as used in standard Kendex holders. They are available in positive or negative rake, and with square or triangular inserts.

Get more information. Ask your Kennametal Representative for a demonstration . . . or write KENNAMETAL INC., Latrobe, Pa. 22501

*Trademark

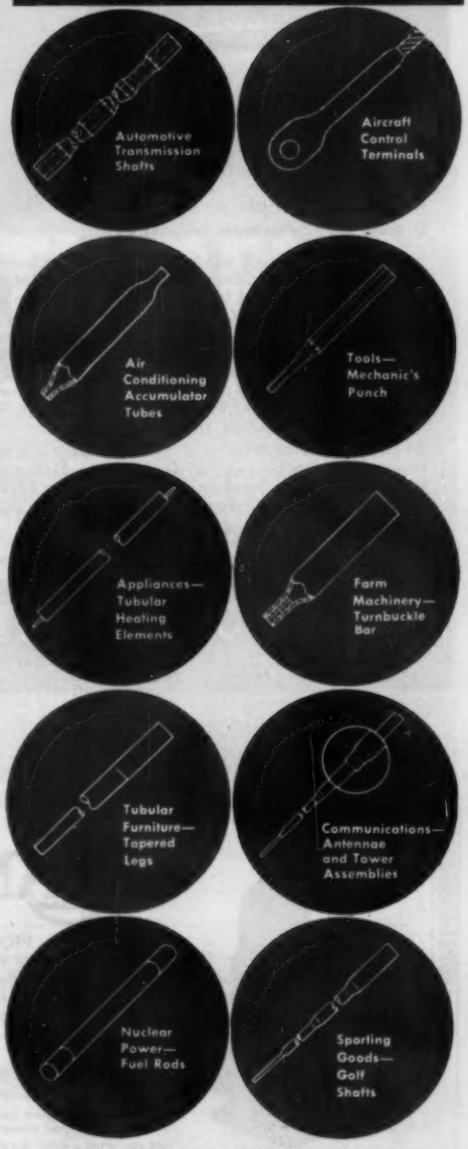


Easily accessible for adjustments. Permits close ganging of tools.

Easy adjustment, regardless of tool position. Just release the clamp and "dial" the breaker to any position desired.

INDUSTRY AND
KENNAMETAL
. . . Partners in Progress

WHAT TORRINGTON ROTARY SWAGING MACHINES CAN DO FOR YOU



These versatile, efficient machines shape metal parts by hammering between dies instead of cutting stock away. They give you a full pound of parts from every pound of metal. They also save you time and labor. Swaging is usually the fastest way to point, taper, reduce or bond metal parts. Tooling is simple and surprisingly inexpensive.

There is no greater authority on swaging than Torrington. Torrington pioneered the swaging process, designed the original equipment and has constantly improved it through innovations in methods and engineering. Today, Torrington operates more swaging machines than any other company in the world. The experience of our engineers is unparalleled. We maintain experimental shops to help you solve your special swaging problems. If you have a part that can be swaged we can design and produce "Job-Tested" dies to your specifications. Come to Torrington with your swaging problems—we have the answers. The Torrington Company, Swaging Machine Division, 200 North St., Torrington, Conn.

progress through precision **ROTARY SWAGING MACHINES**

THE TORRINGTON COMPANY Torrington, Conn.

666 AXLE TIE-RODS Chamfered Per Hour

Another Example of D and T Production Engineering

Here's an interesting example of a special transfer machine using an indexing conveyor chain. Machine chamfers 1⅛" drilled holes on both ends (top and bottom) of rear axle tie rods. Conveyor chain and parts are indexed by air and parts are automatically unloaded. Although built for chamfering only, other similar operations can be incorporated on this basic machine design.
When you need high production with minimum machinery, call in a D & T production engineer. Most basically standard D & T machines can readily be tooled for economic special production.

OPERATION SEQUENCE: 1. Probe and stop machine if parts are not drilled through. 2. Locate from drilled hole and clamp. 3. Chamfer left-hand end. 4. Chamfer right-hand end. 5. Turn over 180°. 6. Chamfer left-hand end. 7. Chamfer right-hand end and automatically unload.

FREE DATA For more examples of outstanding production machine tools, write for Bulletin No. 1002.

Roto-Matic

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ACCURATE SIZING and BETTER FINISH with W & S HOLLOW MILLS

- All I.D. Sizes Up To ⅜" (O.D. Maximum 1")
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- For Ferrous or Nonferrous Metals
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FASTENING DEVICES

This special report summarizes typical mechanical fastening devices and will help you select a fastener that wil lead to a more dependable and economical product. Sixteen pages, fuly illustrated—35c per copy.

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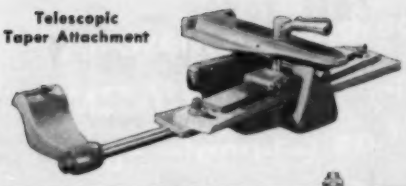
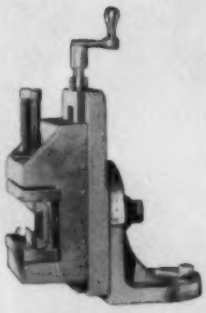

Telescopic Taper Attachment

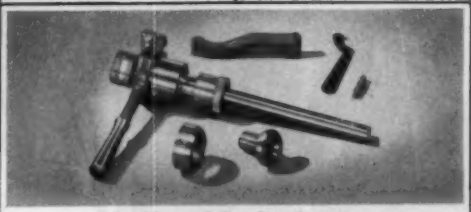
Ball Bearing Live Centers

Follower Rest


Milling Attachment

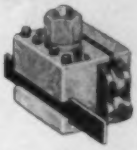
External Grinder

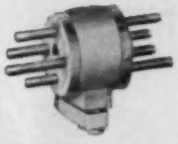
Steady Rest

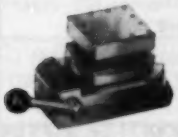

Handlever Collet Attachment

Handwheel Collet Attachment

Collets


10-IN-1 Tool Holder

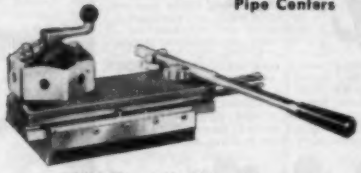

4-Position Carriage Stop

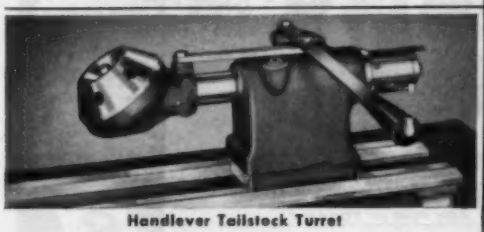

Square Turret Tool Block

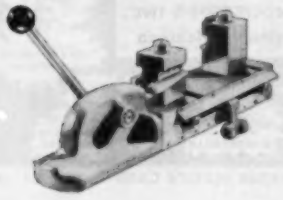
Cutter Bit Grinding Block

Swivel Machine Vise

Pipe Centers


Handlever Bed Turret


Handlever Tailstock Turret


Handlever Double Tool Cross Slide

SOUTH BEND

ATTACHMENTS

help you get more work out of your machines

- CUT MACHINING TIME
- SIMPLIFY DIFFICULT JOBS
- SPEED UP TOOLING
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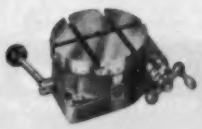
Universal Table


Rotary Indexing Table

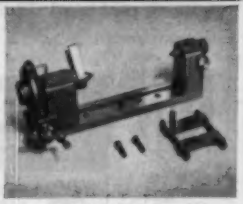

Indexing Centers

Photo taken at Danly Machine Specialties, Inc., showing Kerns SCF-2687 cutting fluid in use.
What makes a good Cutting Fluid?

HERE'S A TYPICAL REPORT . . .

SOURCE—Danly Machine Specialties, Inc.

PRODUCT—Kerns SCF-2687 (Medium duty Soluble Cutting Fluid, a lighter version of Kerns SCF-3207* heavy duty fluid).

ECONOMY—Big savings in lack of down-time necessary to replace fluid.

LIFE—Typical at Danly—400 gal. tank on G&L-570-FCS Horizontal Mill changed only twice since October 1957.

RUST PREVENTIVE—Good.

ODOR—None at all in its natural state.

ANTI-WELD—No problem with build-up of chips.

CLEANLINESS—Excellent.

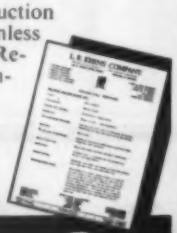
IRRITATING EFFECTS—None

NOTE: *Kerns SCF-3207 is a heavy duty soluble cutting fluid and is the only soluble that will do 99% of the jobs that a heavy sulfurized cutting oil will do.

MEMO BILLING TRIAL BASIS

Try it . . . we supply material for production test . . . no formal invoice rendered unless completely approved in production. Remember . . . with Kerns you get compounds tailored to *your* operation.

Write for further information and technical Data Sheet SCF-3207



L.R. Kerns Co.

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Subsidiary Plant **KERNS PACIFIC CORPORATION** 630 N. BATAVIA ST., ORANGE, CALIFORNIA

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You can solve your gauging problems fast with Deltronic! Over 99% of your orders shipped same day received! And you can depend on our unconditional guarantee: complete satisfaction, or return for full refund!

*NOW PRECISION LAPPED!

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Each set includes nominal size plus 12 up and 12 down in increments of .0001. Cold stabilized. Double-ended, double wear. Ideal for precision production and inspection. Nominals ¾" to 1". Off-shelf delivery. *Under .120 superfinished.

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DO THAT JOB FASTER AND BETTER WITH A Severance MIDGET MILL!
Ask for a SEVERANCE catalog today! You'll find it detailed, well illustrated, suggestive and informative. It includes low reducing prices.
YES, A SEVERANCE MIDGET MILL MAY WELL SOLVE YOUR PROBLEM AND SAVE YOU MONEY, IF YOU MUST REMOVE GATES, FINS, AND RISERS; BREAK SHARP CORNERS AND EDGES; MACHINE CARBON; FINISH CASTINGS OF ANY MATERIAL; WORK FILLETS, RADII, AND GROOVES; DEBURR OIL HOLES; BLEND WELDED AND ASSEMBLED PARTS; REMOVE FLASH; SMOOTH WELD BEADS; OR, ANY OTHER SIMILAR OPERATIONS
MANY STANDARD SHAPES & SIZES TO CHOOSE FROM
SPECIAL SHAPES & SIZES AVAILABLE ON SHORT NOTICE
SEVERANCE MIDGET MILL SET NO. 77 IS A POPULAR SET OF 1/2" DIAMETER, 1/4" SHANK, HIGH SPEED MIDGET MILLS. MAKES A FINE SET-ACQUAINTED-SET AND WILL COVER A BIG MAJORITY OF YOUR NEEDS FOR THIS TYPE TOOL. LEAFLET NO. 651 GIVES DETAILED INFORMATION AND PRICES. ASK FOR IT TODAY!
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BALL SEAT REAMERS

CIRCLE 263 READER SERVICE CARD

Answers to hundreds of METALWORKING questions — on planning and production — COMPLETE IN ONE EASY-TO-USE VOLUME

What leading magazines say about this book

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WELDING JOURNAL: "A valuable aid to machinists, designers, draftsmen, and engineers."

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The NEW AMERICAN MACHINIST'S HANDBOOK

Edited by RUPERT LE GRAND

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1579 pages, 5⅝ x 8,
774 illustrations, $13.00

- **80% REWRITTEN**
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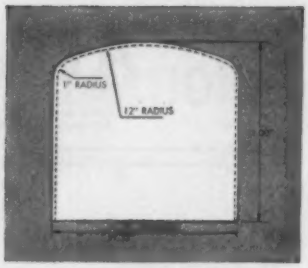
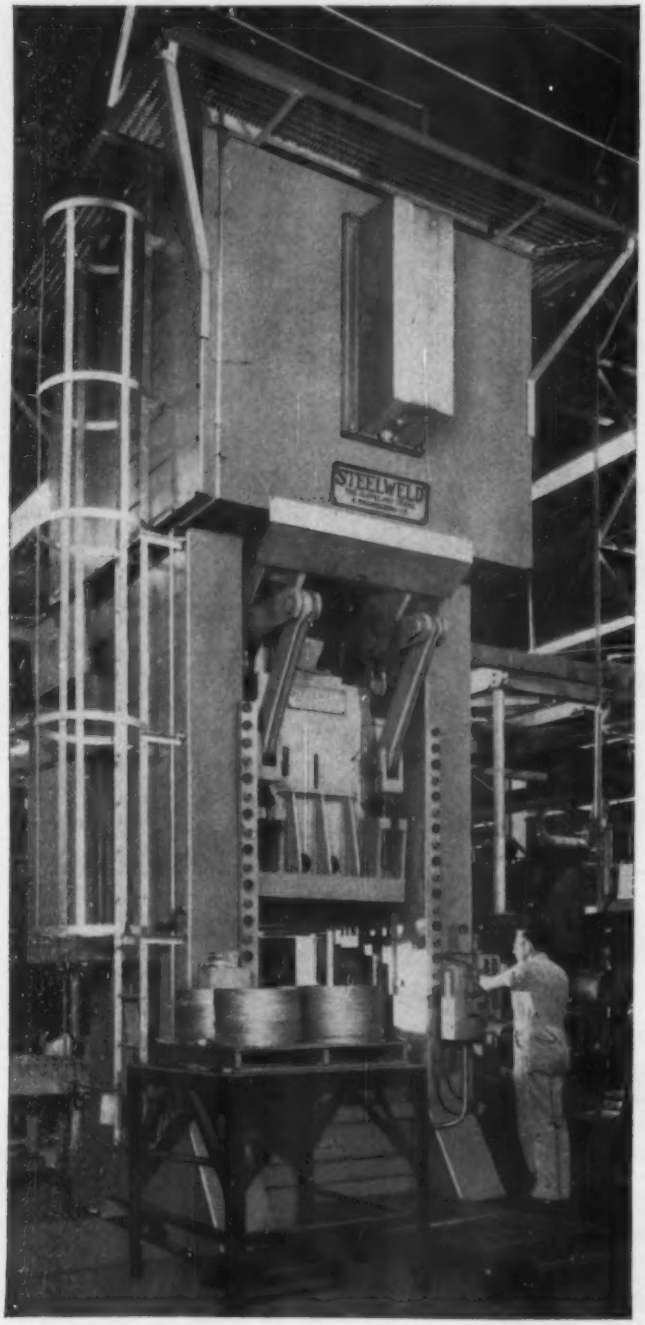
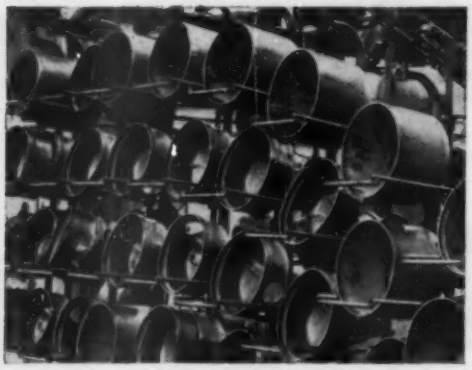
Draw Is Greater than 50% REDUCTION from Blank Size



This shell is stamped in a single draw from a 22¾ inch diameter steel blank. Material is 0.1644" draw-type steel.



Model D1-400-48-54 Steelweld Double-Action Speed-Draw Press rated 400 tons capacity with 48 x 54 inch slide area.



Some of the great number of shells produced daily. All dimensions are held accurately to specifications and the stampings are smooth and uniform.

A new kind of press with unique, patented toggle-eccentric mechanism stamps shells for air-conditioning units in a single draw from 22¾" dia. blanks to dimensions shown in sketch.

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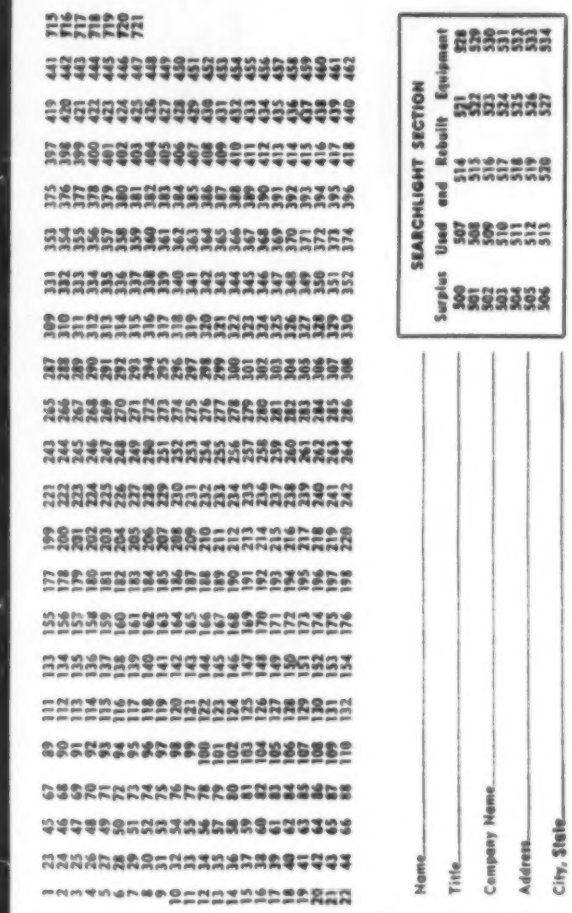

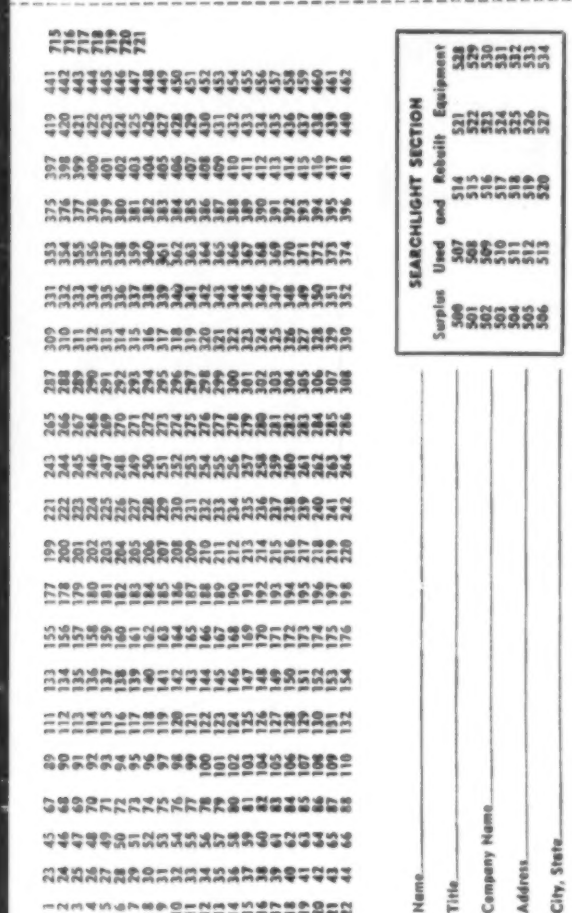

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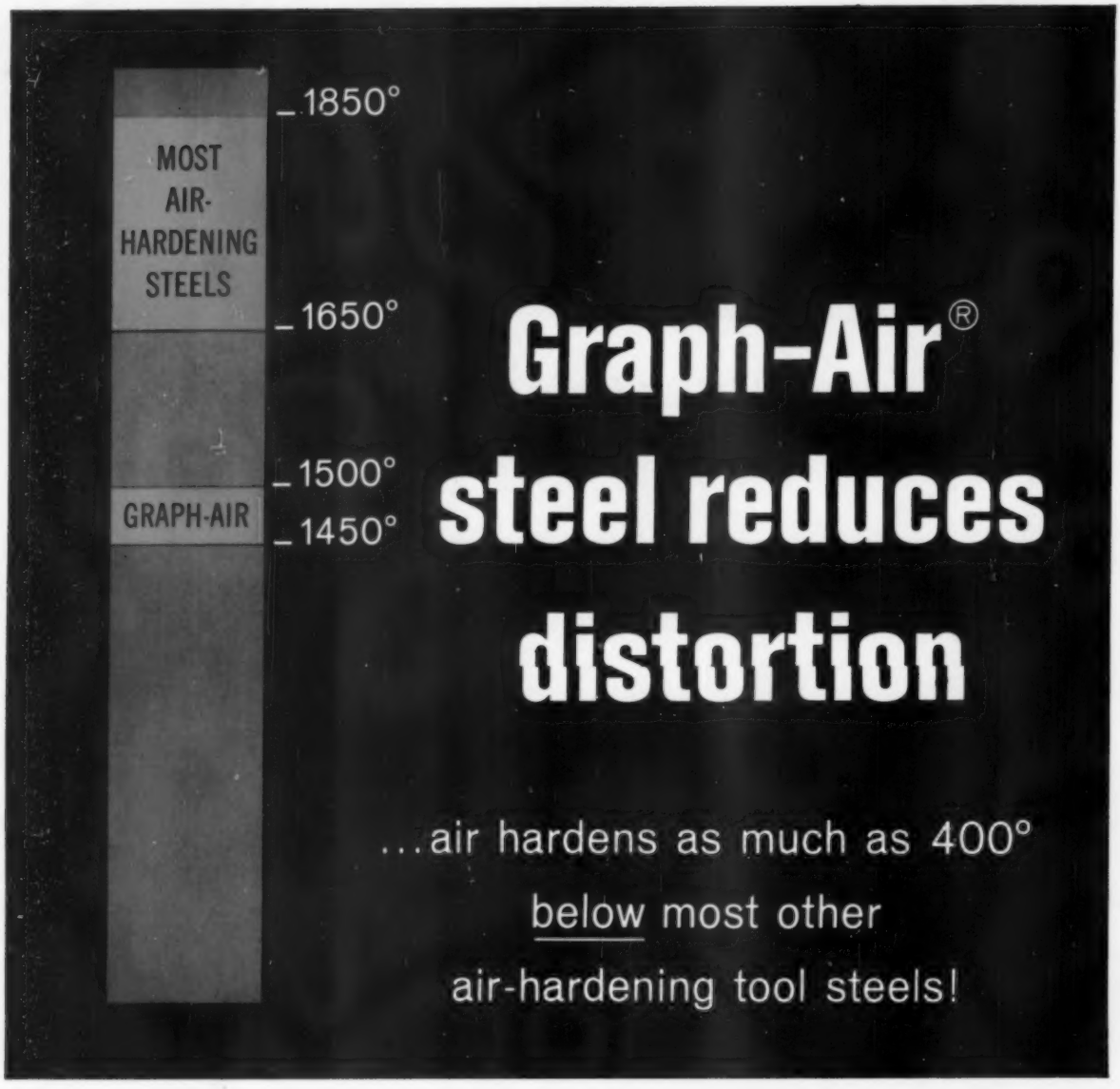

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